NASA/CR-97- 205929

Final

Report 10361C
30 October 1997

GENCORP
AEROJET

5N-18-CR
OCIT

INTEGRATED
Advanced Microwave Sounding Unit-A (AMSU-A) Fabrication and Assembly Flow Plan

Contract No: NAS 5-32314

CDRL: 023

Prepared for:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Prepared by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

Aerojet

GENCORP
AEROJET

DOCUMENT APPROVAL SHEET

TITLE	DOCUMENT NUMBER
Integrated Advanced Microwave Sounding Unit-A (AMSU-A) Fabrication and Assembly Flow Plan	Report 10361C 30 October 1997

INPUT FROM:	DATE	CDRL:	SPECIFICATION ENGINEER:	DATE
		023		

CHECKED BY:	DATE	JOB NUMBER:	DATE
J. Kirk	30 Oct 97		

APPROVAL SIGNATURES	DEPT. NO.	DATE
Responsible Engineer (G. Kirkpatrick) G Kirkpatrick	7451	10-30-97
Team Leader (R. Platt) Robert N Platt	8341	10/30/97
Technical Director/Program Office (R. Hauerwaas) R Hauerwaas	4001	10/30/97
Performance Assurance (R. Taylor) FOR	7831	10/30/97
Configuration Management (J. Cavanaugh) J Cavanaugh	8611	10/30/97

By my signature, I certify the above document has been reviewed by me and concurs with the technical requirements related to my area of responsibility.

RELEASE (Data Center) FINAL

Please return this sheet and the reproducible master to the Data Center (119/8651), ext. 2231.

Electronic Systems Plant

P.O. Box 296
Azusa, California 91702
CAGE/Facility Ident: 70143

Report 10361C
30 October 1997

INTEGRATED
Advanced Microwave Sounding Unit-A (AMSU-A)
Fabrication and Assembly Flow Plan

Contract No: NAS 5-32314

CDRL: 023

Prepared for:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Prepared by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

TABLE OF CONTENTS

Paragraph		Page
1.	Introduction	1
1.1	Overview of Plan	1
1.2	System Description	1
2.	Description and Sequence of Fabrication and Assembly Operations and Processes	3
2.1	Description of Fabrication and Assembly Operations	3
3.	Identification of Fabrication and Assembly Resources	4
3.1	Identification of the Sites of the Operations	4
3.2	Identification of Tooling and Facilities Required	4
3.2.1	Tooling Requirements	4
3.2.2	Facilities Requirements	4
3.3	Requirements for Inspection and Test Stations	4
3.3.1	Inspection Station Requirements	5
3.3.2	Test Station Requirements	6
4.	Description of the Cognizant Organizational Structure	7
4.1	Manufacturing Organization	7
4.1.1	Manufacturing Engineering	8
4.1.2	Production Control	8
4.1.2.1	Material Planning and Control	8
4.1.2.2	Capacity Planning/Scheduling	8
4.1.2.3	MRP Systems Management	8
4.2	Production	8
4.3	Related Organizations	8
4.3.1	Environmental Test Operations	8
4.3.2	Quality Assurance Operations	9
4.3.3	Procurement Operations	9
5.	Description of System of Controls on Fabrication and Assembly	10
5.1.1.3	Manufacturing Indentured Assembly Breakdown (MIAB)	10
5.1.1.4	Integrated Manufacturing, Inspection, and Test Plan (IMITP)	10
5.1.2	Shop Order Planning	10
5.1.2.1	Design Release	12
5.1.2.2	Shop Order	12
5.1.2.3	Manufacturing Assembly Instructions (MAI)	12
5.1.2.4	Manufacturing Process Instructions (MPI)	12
5.1.3	Manufacturing Resource Planning (MRPII)	12
5.1.3.1	Production Schedule	12
5.1.3.2	Requisitions to Procure (RTP)	13
5.1.3.3	Manufacturing Kit List Requisition (MKLR)	13
5.2	Production Control	13
5.2.1	Material Control	13
5.2.2	Work In-Process Control	13
5.2.4	Microsoft Project	13
6.	Integrated Manufacturing and Inspection Flow Chart	15
7.	Abbreviations and Acronyms	16

TABLE OF CONTENTS (CONT'D)

FIGURES

Figure		Page
1	AMSU-A1 Instrument	2
2	AMSU-A2 Instrument	2
3	Aerojet Azusa Production Facilities	5
4	Manufacturing Organizational Structure	7
5	Production Planning Process through Shop Order Release	11

APPENDIXES

Appendix		Page
A	Production Tooling List	A-1
B	Integrated Manufacturing, Inspection, and Test Plan (IMITP)	B-1

SECTION 1

INTRODUCTION

1.1 OVERVIEW OF PLAN

This *Fabrication and Assembly Flow Plan* is submitted in response to CDRL 023 under contract NAS5-32314 for the Advanced Microwave Sounding Unit–A (AMSU-A). In response to the CDRL instructions, this document presents the fabrication, assembly, inspection, and test sequences, locations, operations, and controls for hardware articles at all levels of assembly to be manufactured by Aerojet.

1.2 SYSTEM DESCRIPTION

Figures 1 and 2 show the AMSU-A1 and AMSU-A2 modules, respectively.

The AMSU-A1 module processes data on 13 channels and the A2 module processes data on 2 channels. Each module consists of the following subsystems:

a. Antenna Subsystem

b. Receiver Subsystem

c. Signal Processor/Power Distribution Subsystem

d. Structural/Thermal Subsystem

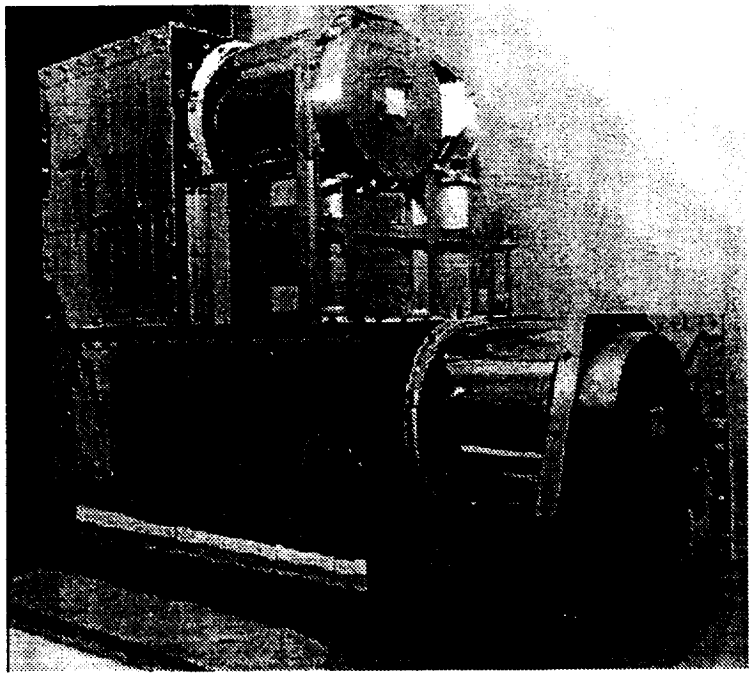


Figure 1. AMSU-A1 Instrument

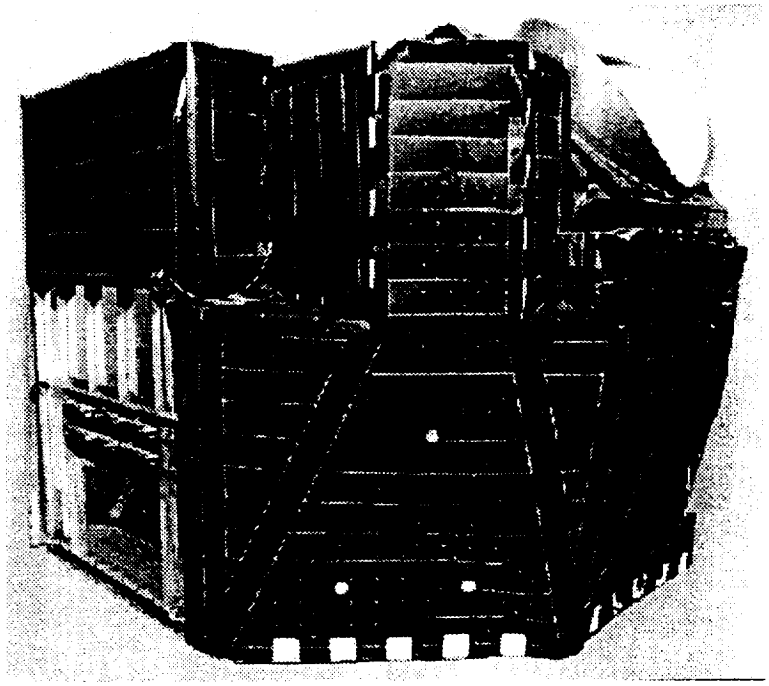


Figure 2. AMSU-A2 Instrument

SECTION 2

DESCRIPTION AND SEQUENCE OF FABRICATION AND ASSEMBLY OPERATIONS AND PROCESSES

The top-level fabrication and assembly flow of the A1 module is shown in the flow charts presented in Section 6. The preparation of the detailed flow charts (referred to at Aerojet as the IMITP) is discussed in 5.1. The A2 module is shown in Section 6.

2.1 DESCRIPTION OF FABRICATION AND ASSEMBLY OPERATIONS

Physical construction starts with the fabrication of machined parts for the Antenna Subassembly, the basis for the Antenna Assembly. After testing the Antenna Assembly, the Core Assembly (with thermal sensors) is installed. The Feedhorn Assembly is fabricated and sent to outside vendors for processing (conversion coating and diplexer-to-feedhorn tuning) before being installed into the Antenna Assembly. The Housing Subassembly is fabricated and inspected, then the motor and resolver are installed to make up the Drive Assembly, which is installed into the Antenna Assembly. The Reflector Assembly is fabricated and then installed into the Antenna Assembly. The finished Antenna Assembly is Acceptance Tested to its Subsystem Specification utilizing the appropriate Test Procedure (as defined in the Performance Verification Plan, CDRL 022). The Antenna Assembly provides the housing for installation of the other major subsystems.

The A1-1 RF Shelf is fabricated, tested, and installed into the housing. The Circuit Card Assemblies are fabricated, tested, and temporarily installed into the Card Rack in the housing. Next, the A1-2 RF Shelf is fabricated, tested, and installed into the housing. The Signal Processor is fabricated, tested, and temporarily installed into the housing, followed by installation of the subcontracted DC/DC Converter. Finally, the Preamp Detector Assembly is fabricated, tested, and temporarily installed.

With the instrument now functionally complete, an intensive battery of tests is performed (as defined in the Performance Verification Plan, CDRL 022). Upon successful completion of these tests, the instrument is partially lisassembled. The panels are removed so that the Mirror Panel Assembly, which is separately fabricated, can be bonded. The Circuit Card Assemblies, the Signal Processor Assemblies, and the Preamp Detector Assembly are removed for final processing.

Then, the instrument is final reassembled, inspected, and submitted to Acceptance Testing, which includes environmental testing and calibration. After Acceptance Testing, the instrument is cleaned (as defined in the Contamination Control Plan, CDRL 007), inspected, and the separately fabricated Insulation Blanket is installed. This finished instrument is installed into its Shipping Container, inspected, and delivered to the Spacecraft Integrator.

SECTION 3

IDENTIFICATION OF FABRICATION AND ASSEMBLY RESOURCES

3.1 IDENTIFICATION OF THE SITES OF THE OPERATIONS

AMSU-A will be produced at Aerojet's Azusa Operation, shown in Figure 3. The production facilities at the Azusa location are a complex of buildings working together, with each having its own function. The production and test operations on the AMSU-A program will be performed at the following sites:

Building 57: Building 57 is scheduled to be the center of all manufacturing activities for AMSU-A and all other millimeter sensor production. It contains the machine shop (environmentally isolated from assembly areas), the circuit card assembly fabrication, box and subsystem assembly and antenna range test facility, the system-level integration and in-process test facilities.

Building 183: All environmental stress testing, such as vibration and thermal/vacuum conditioning, and final acceptance testing will take place in the Building 183 Environmental Laboratories. A detailed layout and description of test areas of this facility is provided in Section 7 of the Performance Verification Plan (CDRL 022).

Building 200: The manufacture of insulation blankets and mirror panels will be moved to a renovated facility in Building 200, previously used to assemble microelectronic circuits.

3.2 IDENTIFICATION OF TOOLING AND FACILITIES REQUIRED

Tooling and facilities are identified as described in 5.1, Production Planning. The IMITP flowchart (provided in Section 6) and the associated Manufacturing Process Analysis Charts (described in 5.1) are used to identify all tooling, facility, process, and resource needs for producing the AMSU-A instrument.

3.2.1 TOOLING REQUIREMENTS. A review of tooling and facilities requirements for AMSU-A shows that in almost all instances these requirements are met by facilities and tooling already being used on NOAA/AMSU-A. The present NOAA/AMSU-A tooling will be retained for the AMSU-A program. The differences between AMSU-A and NOAA/AMSU-A do not appear to require new or additional tooling. The use of a bottom-mount configuration for the EOS/AMSU-A A1 module (versus the current side-mount configuration) will require minimal modifications to existing manufacturing tooling (transport and environmental test fixtures are being redesigned by the Ground Support Equipment Product Team). The building of the PLO in-house does not require any additional tooling. EOS/AMSU-A requires the MIL-STD-1553 bus interface change in Circuit Card Assemblies (CCA). All CCA will still be built in the Circuit Card Assembly shop with general-purpose tooling. The new DC/DC Converter will be produced by a subcontractor, and not require any new Aerojet tooling.

A list of NOAA/AMSU-A tooling to be used on AMSU-A production is included as Appendix A.

3.2.2 FACILITIES REQUIREMENTS. A review of facilities requirements for AMSU-A shows that in all instances these requirements are met by facilities already being used on NOAA/AMSU-A. The present NOAA/AMSU-A fabrication facilities are being relocated to Building 57, as discussed in 3.1. The proven thermal-vacuum and vibration equipment in Building 183 will be used for the program, using test methods developed and verified on the NOAA program.

3.3 REQUIREMENTS FOR INSPECTION AND TEST STATIONS

Inspection and test stations are identified as described in 5.1. The Manufacturing, Inspection, and Test Process (MITP) flowchart and the associated Manufacturing Process Analysis Charts are used to identify all inspection and test station needs for producing the AMSU-A instrument.

3.3.1 INSPECTION STATION REQUIREMENTS. A review of Inspection Station requirements for AMSU-A shows that these requirements are met by inspection stations already being used on NOAA/AMSU-A or by test stations being built on AMSU-A to handle the MIL-STD-1553 bus. The present NOAA/AMSU-A fabrication facilities, with their existing Inspection Stations, are being relocated to Building 57, as discussed in 3.1.

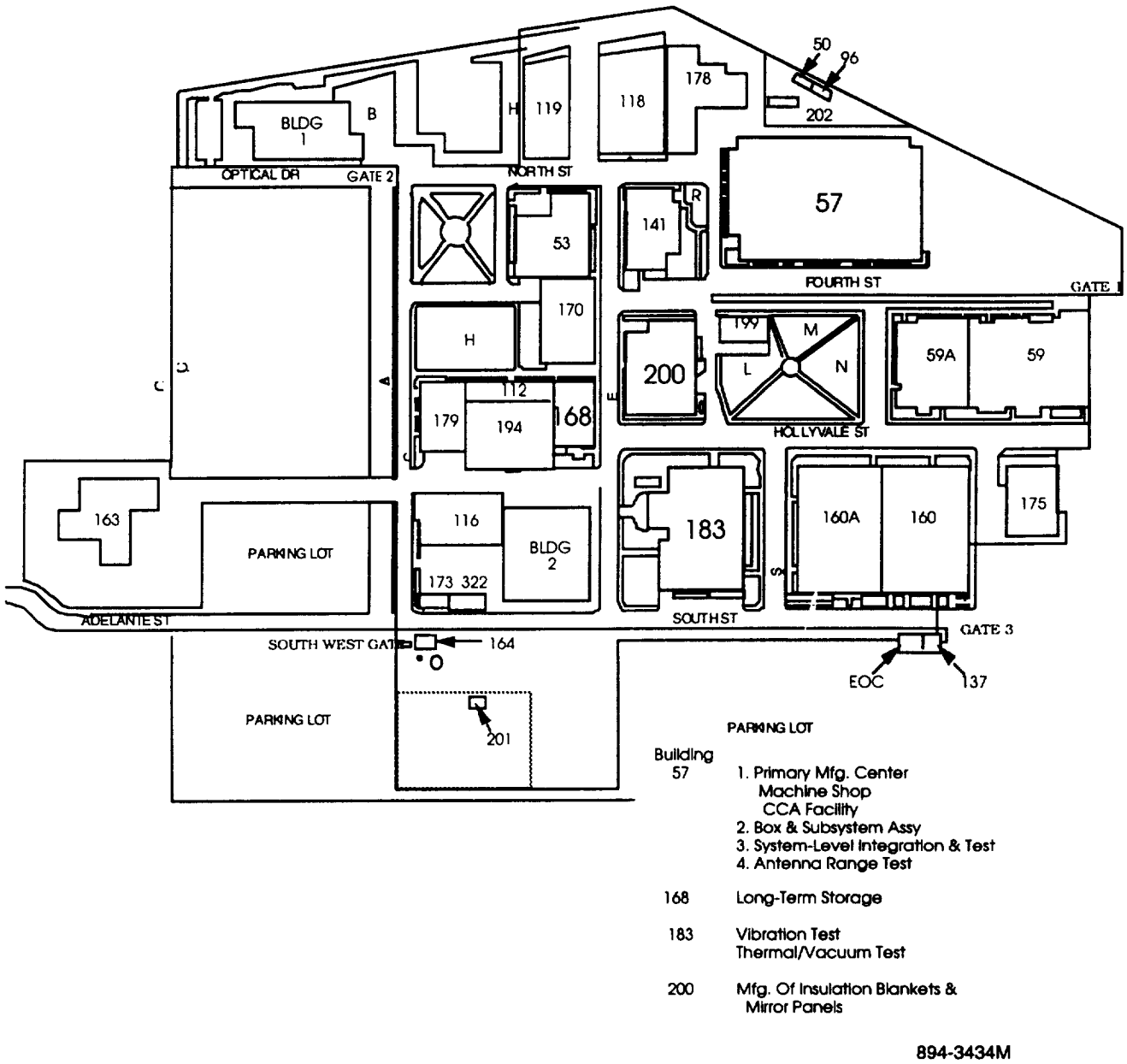


Figure 3. Aerojet Azusa Production Facilities

3.3.2 TEST STATION REQUIREMENTS. A review of Test Station requirements for AMSU-A shows that these requirements are met by facilities already being used on NOAA/AMSU-A. The present NOAA/AMSU-A fabrication facilities, with their existing in-process Test Stations, are being relocated to Building 57, as discussed in 3.1.

Modifications to the NOAA/AMSU-A1 Calibration Test Equipment (CTE) to accommodate the EOS version are being evaluated and reflected in its engineering documentation. The proven thermal-vacuum and vibration equipment in Building 183 will be used for the EOS program, using test methods which have been developed and verified on the NOAA program.

Test stations will support all testing defined in the Performance Verification Plan (CDRL 022). Section 6 shows the overview of testing required by that document.

SECTION 4

DESCRIPTION OF THE COGNIZANT ORGANIZATIONAL STRUCTURE

At Aerojet, teams are to be used whenever tasks demand cross-functional expertise to achieve goals. The majority of the tasks on the AMSU-A Program demand cross-functional expertise. Therefore, the AMSU-A Program organization is an Integrated Product Team (IPT), composed of a number of Product (sub)Teams (PT).

Each team includes a team leader and representatives from all required supporting functional organizations. The concept requires that the team members form a cohesive group who work together to develop and support efficient production processes and design functions, and to meet production schedule, cost, and quality goals. The team leader functions as a coordinator to ensure that all team members are aware of requirements and problems, so that efforts will be coordinated and directed for maximum effectiveness.

4.1 MANUFACTURING ORGANIZATION

The Manufacturing Organization has all the capabilities and facilities necessary to build and test the EOS/AMSU-A instrument.

The Manufacturing Engineer is the primary interface between the individual Product Team and the manufacturing organization. He works as a key member of the Product Team under the project direction of the Product Team Leader. The Manufacturing Engineer is responsible to the Product Team for coordinating production planning, control, and execution so that produced hardware meets the requirements of the Product Team on-schedule.

The Manufacturing Organization, shown in Figure 4, is composed of three disciplines: Production Control, Manufacturing Engineering, and Production. These are described in the following Sections.

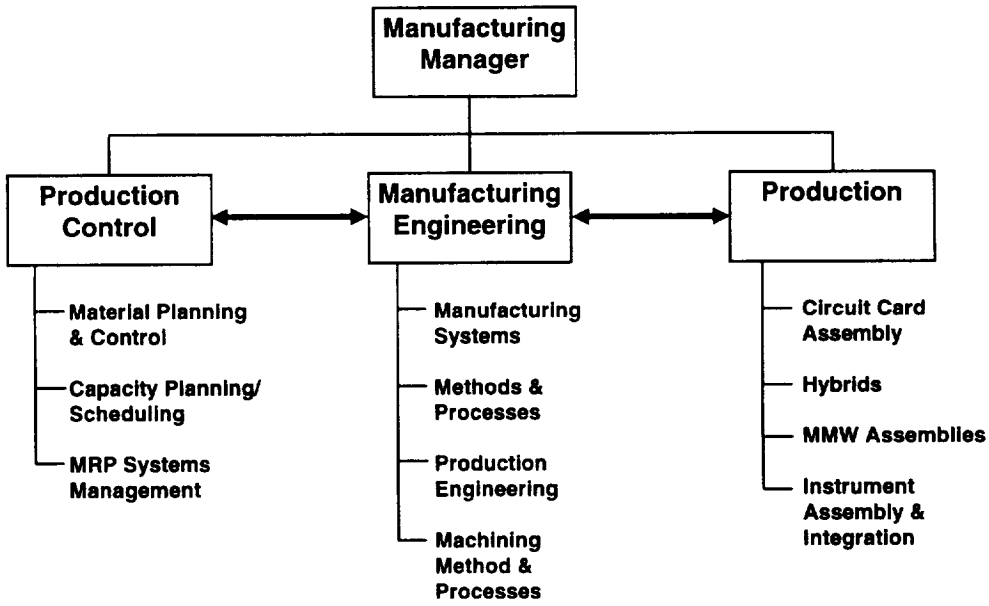


Figure 4. Manufacturing Organizational Structure

4.1.1 MANUFACTURING ENGINEERING. In addition to its role as the primary interface between the individual Product Team and the manufacturing organization, Manufacturing Engineering plans, develops, and continuously improves the manufacturing systems, technologies, processes, facilities, and equipment required to efficiently produce the highest quality products.

As manufacturing commences, Manufacturing Engineering is co-located at the production facilities. Manufacturing Engineering provides direct and immediate support to the manufacturing team. By this close exposure to the needs of the manufacturing team, Manufacturing Engineering ensures the adequacy of all procedures, instructions, drawings, tooling, fixturing, training, and facilities. In addition, Manufacturing Engineering is able to rapidly focus other Product Team members on the needs of the manufacturing team.

4.1.2 PRODUCTION CONTROL. The Production Control organization supports all manufacturing systems and procedures with detailed planning and control services in the areas of material control, capacity planning/scheduling, and inventory control. Production Control supports the Manufacturing Engineer and the Product Teams with Manufacturing Resource Planning (MRP) II.

4.1.2.1 Material Planning and Control. Material Planning and Control is responsible for identifying, monitoring, and driving time-phased material requirements through the MRP II system. Material Planning and Control manages the entire material flow process from the incoming dock to the shipment of the product. Under Material Planning and Control are two groups: Program Material and Warehouse.

Program Material is responsible for maintaining the MRP on each program and controlling and executing material flow on the shop floor.

Warehouse is responsible for receiving, inspecting, storing, and issuing material; packaging and shipping product; and maintaining a bonded warehouse.

4.1.2.2 Capacity Planning/Scheduling. Capacity Planning/Scheduling assists the Product Teams by providing and operating the management tools for production planning, scheduling, and controlling of time and resources.

4.1.2.3 MRP Systems Management. MRP Systems Management is responsible for ensuring the MRP system's state-of-health, obtaining maximum efficiency from MRP, ensuring MRP data integrity, identification of MRP improvement opportunities, leading CINCOM upgrades, identification and assisting in the solution of problems, and maintaining MRP functional procedures.

4.2 PRODUCTION. The Aerojet production facility in Building 57 is organized around production teams. The applicable Building 57 Supervisor (machine shop, electronic fabrication, assembly, etc.) is responsible for providing qualified operators and technicians for production of the AMSU-A hardware to support the forecasted production schedules. Building 57 personnel report functionally to the Supervisor, who is the conduit to upper Manufacturing Management.

For program activities, such as the AMSU-A production, Building 57 personnel are responsible to the applicable Product Team, through the Manufacturing Engineer. The Manufacturing Engineer works for and supports the Product Team Leader/Product Team. He ensures that proper documentation and material is available. He ensures the adequacy of all procedures, instructions, drawings, tooling, fixturing, training, and facilities, and is able to rapidly focus other Product Team members on the needs of the manufacturing activity. To support production personnel, the key members of the Product Teams will be co-located at the production facilities.

4.3 RELATED ORGANIZATIONS

4.3.1 ENVIRONMENTAL TEST OPERATIONS. Although not directly under the Manufacturing Organization, Aerojet's Environmental Test Operations work closely with manufacturing and are included within manufacturing schedules. The manufacturing flow plan, provided in Section 6, includes Environmental Test steps. On AMSU-A, manufacturing supports Environmental Test Operations by preparing and fixturing components, subsystems, and higher-level assemblies for

thermal, thermal/vacuum, and vibration testing. Manufacturing tracks these testing operations closely, so as to be ready to proceed with the next fabrication/assembly step without undue delay.

4.3.2 QUALITY ASSURANCE OPERATIONS. On a parallel with the Manufacturing Organization, Aerojet's Quality Assurance Organization work closely with manufacturing, and are included within manufacturing schedules. The manufacturing flow plan, provided in Section 6, includes all inspection, test witness, and GSI steps. Manufacturing works closely with Quality Assurance to move hardware efficiently through all steps of the overall process.

4.3.3 PROCUREMENT OPERATIONS. Although not directly under the Manufacturing Organization, Aerojet's Procurement Operations work closely with manufacturing (to provide material and component, subcontracted items, and outside services and processing), and are included within manufacturing schedules.

SECTION 5

DESCRIPTION OF SYSTEM OF CONTROLS ON FABRICATION AND ASSEMBLY

5.1 PRODUCTION PLANNING

The AMSU-A Production Planning Process is shown in Figure 5. This diagram shows the participation of the various members of each Product Team (Design, Configuration Management, Manufacturing Engineering, and Procurement) as well as their interaction with Program Management. As shown, each of the process steps is implemented by procedural documentation.

5.1.1 INTEGRATED MANUFACTURING, INSPECTION, AND TEST PLAN

5.1.1.1 Concurrent Engineering. As shown in Figure 5, the program is kicked-off by the Program Management Team with the release of the Program Plan (CDRL 001) and Schedule, (which incorporates preliminary manufacturing planning). This initiates (through the System Engineering process) the preliminary design by the Product Teams. Manufacturing Engineering, Quality Assurance, and Procurement participate in the Product Teams (PT) from the outset, ensuring that producibility issues are considered in each design decision.

The Manufacturing Engineering member of each PT reviews/approves all engineering-released drawings, suggesting productivity improvements, identifying necessary processes, tooling, fixturing, etc., and providing feedback on costs, lead-times, and other considerations.

Concurrent Engineering activities continue throughout the program.

5.1.1.2 Make or Buy List. As the PT create their Parts Lists, they are incorporated into the engineering-release system operated by Configuration Management. Manufacturing Engineering converts the Manufacturing Bill of Material structure into a Make-or-Buy List with make/buy recommendations. The AMSU-A Make-or-Buy List, together with the Manufacturing Bill of Material structure, is provided in Appendix B and consists of a listing of the major subassemblies, assemblies, subsystems, and components to be assembled or fabricated by Aerojet and those supplied by subcontractors or piece part suppliers. An integral part of this Make-or-Buy List is the definition of the manufacturing Bill-of-Material (BOM) structure.

At this stage, the Make-or-Buy Lists are used to structure the Manufacturing Indentured Assembly Breakdown (MIAB) from MRPII, leading to the IMITP flow chart. After formal design release, the Make-or-Buy Lists are further annotated (as described in 5.1.3) by Manufacturing Engineering and provided to Configuration Management to be used as the basis for creating an Engineering BOM in MRP II.

5.1.1.3 Manufacturing Indentured Assembly Breakdown (MIAB). The Make-or-Buy Lists are used by Manufacturing Engineering to structure the MRPII Manufacturing Indentured Assembly Breakdown (MIAB).

5.1.1.4 Integrated Manufacturing, Inspection and Test Plan (IMITP). The MIAB is used to define the structure of the IMITP flow chart.

Quality Assurance has participated in the preparation of the IMITP and has established the inspection and witness steps. The IMITP has also been provided to the government representative for information/review.

5.1.2 SHOP ORDER PLANNING. This paragraph describes the Shop Order Planning Process as shown in Figure 5. The main product of this phase is the Shop Order Package, required by production to initiate all fabrication and assembly effort on AMSU-A.

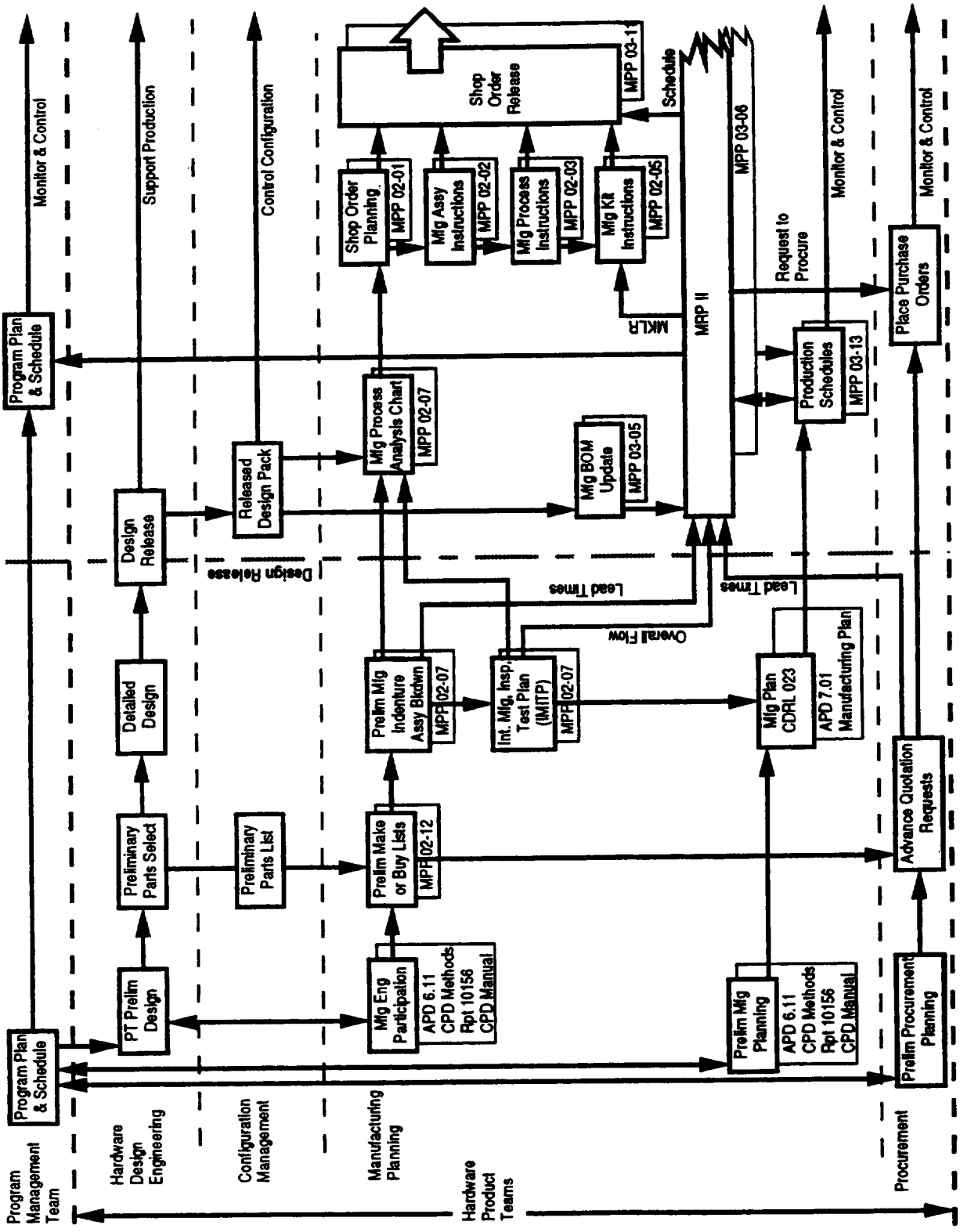


Figure 5. Production Planning Process through Shop Order Release

The Shop Order Package is the package of instructional documents prepared by Manufacturing Engineering which provides to the factory workstation all of the information necessary for material identification, process instructions, material handling and packaging, record of acceptability, and cost accounting charge numbers. This package consists of, but is not limited to, Shop Orders, Manufacturing Assembly Instructions, Manufacturing Process Instructions, Inspection Instructions, and MKLR.

The activities related to the MRP II planning are covered in 5.1.3.

5.1.2.1 Design Release. Formal Design Release normally occurs just after Critical Design Review, although design documents for long-lead and other critical items may be incrementally released earlier. Configuration Management releases all design documents under full configuration control. At this time, the Make-or-Buy Lists are reviewed and updated. The Make-or-Buy Lists are further annotated by Manufacturing Engineering and provided to Configuration Management to be used as the basis for creating an Engineering BOM in MRP II.

5.1.2.2 Shop Order. The Shop Order is the document that provides Manufacturing process planning and routing information through Manufacturing, Inspection and Test, disposition of finished goods, and authorization of the expenditure of labor. It includes the cost accounting charge number and variable information (shop order number, schedule data, serialization requirements, work order number, start quantity, and any other shop order release information that is added to a shop order at the time of issuance). Shop Orders are generated by Manufacturing Engineering based on the IMITP and the drawings.

5.1.2.3 Manufacturing Assembly Instructions (MAI). MAI are detailed, controlled instructions for assembling material to satisfy engineering drawing requirements. These instructions may be supported by Manufacturing Process Instructions for assembly processes and Inspection Instructions for inspection operations.

5.1.2.4 Manufacturing Process Instructions (MPI). MPI are controlled, step-by-step procedures describing the operations that comprise a process common to groups of part numbers. MPI are equipment-discipline related rather than piece-part oriented. MPI usually provide instructions for the use of tooling, equipment, and supplies.

5.1.3 MANUFACTURING RESOURCE PLANNING (MRP II). Upon receipt of the program drawing tree, Manufacturing Engineering leads the product teams by preparing a Make-or-Buy Plan. This consists of a listing of the AMSU-A system's major subassemblies, assemblies, subsystems, and components to be assembled or fabricated by Aerojet and those supplied by subcontractors or piece-part suppliers. An integral part of this Make-or-Buy Plan is the definition of the manufacturing Bill-of-Material (BOM) structure.

The manufacturing BOM structure and the complete Make-or-Buy Plan are provided to Configuration Management to be used as the basis for creating an Engineering BOM in MRP II from the individual parts lists.

A computer printout of this Engineering BOM is then returned to Manufacturing Engineering for review and mark-up of incomplete part numbers, and quantification of as-required materials.

Configuration Management modifies the engineering data base to reflect these changes, and at the same time flags these changes as manufacturing-derived requirements.

Once the Manufacturing BOM has been established in MRP II, Procurement adds the procurement lead times for all purchased items and Manufacturing Engineering adds the manufacturing lead and cycle times as well as shrinkage factors for all make items.

Production Control then creates an Independent Demand for the final or top assembly part number as defined by the MBOM structure, by connecting its completion to the contractual completion or delivery date. When an MRP II run is requested, the MRP II System backward-schedules all activities by part number and provides need dates for Procurement and kit release dates to Production Control.

5.1.3.1 Production Schedule. Based upon the delivery requirements and the commonalities between the current NOAA and AMSU-A, a detailed Microsoft Project Network Master Schedule has been prepared. The Microsoft Project Schedule, in

conjunction with the Manufacturing Resource Planning (MRP) II System, generates the detailed manufacturing schedules and component delivery schedules necessary to satisfy program demands.

The individual lead times used in the development of the detailed Master Production Schedules are based extensively upon the actual times experienced with similar and identical components and assemblies of the NOAA/AMSU-A System.

5.1.3.2 Requisitions to Procure (RTP). Material Control requests MRP II to generate Requests to Purchase (RTP), which are the authority for Procurement to initiate Purchase Orders. The MRP II System monitors and provides information to Procurement, Production Control, Program Office, and the Integrated Product Teams as to the status of the material needed to fabricate and to assemble their product.

5.1.3.3 Manufacturing Kit List Requisition (MKLR). The MKLR is a computerized listing (Pick List) of all parts, in extended quantities, required to be issued from Main Stores or In-Process Stores to produce the number of assemblies required for a Shop Order. The MKLR serves as an accountable material issue document, as a documentary record of material incorporated into the shop order end item, and material used in the manufacturing process.

5.2 PRODUCTION CONTROL

The individual hardware Product Teams have the overall responsibility to move their hardware through production, inspection, and test to integration with the next higher assembly.

5.2.1 MATERIAL CONTROL. The Manufacturing Engineer utilizes the services of the Material Planning and Control group under Production Control to monitor and control the flow of required material to the production workstations. Material flow is monitored through the MRP II system and is reported on terminals throughout the production area in real time. In addition, the weekly MRP report documents all material status and flags all exceptions. The impact of material flow problems, indicated by the MRP II reports, is reflected in the Microsoft Project schedule and escalated to the weekly Program Management meetings.

5.2.2 WORK-IN-PROCESS CONTROL. The Manufacturing Engineer utilizes the services of Production Control to monitor and control the flow of work-in-process (WIP) through the production workstations. WIP flow is monitored through the MRP II system and is reported on terminals throughout the production area in real time. In addition, the weekly MRP report documents all WIP status and flags all exceptions. The impact of WIP flow problems, indicated by the MRP II reports, is reflected in the Microsoft Project schedule and escalated to the weekly Program Management meetings.

5.2.3 MRP II. As discussed above, MRP II is the central method of material and WIP control. MRP data are available to the Product Team members in real time on the shop floor and are published in weekly status reports with all exceptions flagged.

5.2.4 MICROSOFT PROJECT. All events in the AMSU-A program are scheduled and reported in the Microsoft Project scheduling system. The Microsoft Project database was developed from planning sheets generated by the Product Team Leaders and reviewed and negotiated with the Program Manager. The database is continually updated to reflect the current planning and status of all events.

Microsoft Project is a project management system to schedule and manage programs with thousands of activities, define how activities relate one to another, identify critical paths, define resource pool and assign them to activities, and perform work-around simulations. Microsoft Project produces a Task Network describing the collection of interrelated tasks and milestones that must be completed to achieve the project goals. The task network is used to control the program; that is, to track actual progress and compare it to the baseline plan.

The Critical Path is a useful technique for evaluating the initial task plan as well as for dealing with changes and actual progress. Microsoft Project calculates the total float (the amount of delay that will not affect the overall completion date) for each task. Critical tasks are ones with zero or less total float. Any delay of one of these tasks will delay the entire project. Together, the critical activities form the critical path of the project. These activities get the highest attention from management. Microsoft Project can be made to calculate a sequence of next most critical paths (ones with the next smallest combined total float). These top critical paths can be published for management review.

To afford maximum control over the program, the initial task network is stored as the baseline. During the program, Microsoft Project generates comparison reports that flag differences from the baseline. Time progress is monitored using actual start dates, actual finish dates, remaining duration (work still to be completed), and percentage complete of original duration. After each new entry of actual progress, a new schedule is calculated for the remaining work, and reports are generated that reflect the current project status.

SECTION 6

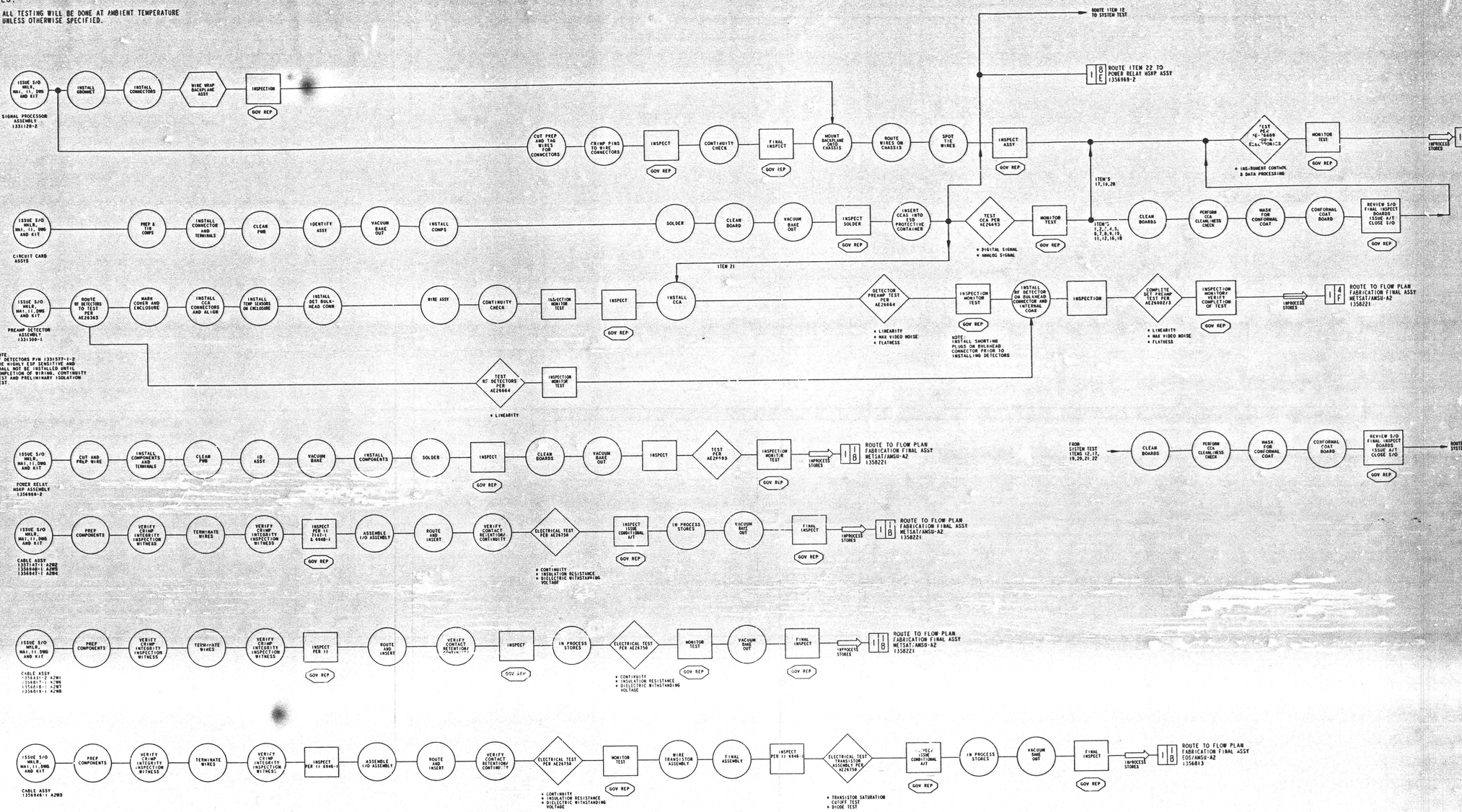
INTEGRATED MANUFACTURING AND INSPECTION FLOW CHART

The detailed Manufacturing and Inspection Flow Chart, referred to at Aerojet as the Integrated Manufacturing, Inspection, and Test Plan (IMITP) described in 5.1.1, depicts all fabrication, processing, and assembly operations; testing at the subcomponent levels; associated inspection points and documentation. The IMITP for the complete AMSU-A is provided in Appendix B.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	10/29/97	

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



CCA'S FOR METSAT A2 ASSEMBLE 1331200-2			
ITEM	SIGNAL PROCESSOR 131120-2	PREAMP DETECTOR 1331300-1	POWER RELAY & HSRP 1356969-1
1	1331688-1		
2	1331682-1		
3	1338421-1		
4	1356418-1		
5	1338424-1		
6	1356911-2		
7	1331147-1		
8	1331144-1		
9	1331150-1		
10	1331135-2		
11	1356413-2		
12	1331126-1		
13			
14			
15			
16	1331129-1		
17	* 1331697-1		
18	1331672-1		
19	* 1337739-2		
20	* 1331694-4		
21		* 1331674-3	
22			*1356908-2

* CCA THAT HAS T & S COMPONENTS

SYMBOLS KEY

ASSEMBLY OPERATION

TEST OPERATION

PC MOVE OPERATION

GOV REP GOVERNMENT REPRESENTATIVE

OUTSIDE PROCESSING

INSPECTION OPERATION

PART DASH NO.	NEXT ASSY	FINAL ASSY	NEXT ASSEMBLY	USED ON APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER DOD-D-1000

CONTR NO	NAS 5-32314	
DRAWN	R A CORREA	96-11-06
CHECK	J GOODROW	3-19-97
DESIGN	R PLATT	3-3-97
~~ENGG~~ NASA	R RODRIGUEZ	3-19-97
~~MATERIALS~~ SCHC	M BINNEY	3-19-97
PRODUCTION	G KIRKPATRICK	3-19-97
DESIGN ACTIVITY	R.HAUERWAAS	3-19-97
Q.A.	R.TAYLOR	3-19-97
C.M.	J.CAVANAUGH	3-19-97

GenCorp Aerojet — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION ELECTRONIC METSAT/AMSU-A2

SIZE	CAGE CODE	DWG NO.
E	70143	1358223

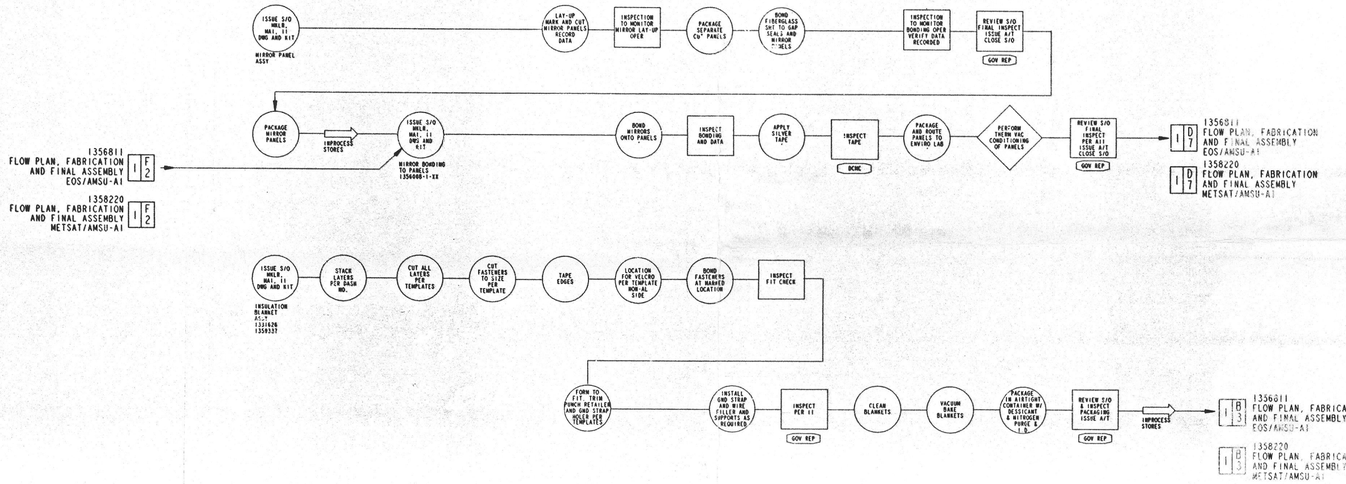
SCALE NONE REL DATE — WT — SHEET 1 OF 1

DO NOT SCALE DRAWING

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
	SEE INC. A DECN	3/19/97	

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



SYMBOLS KEY

- ASSEMBLY OPERATION
- TEST OPERATION
- PC MOVE OPERATION
- GOVERNMENT REPRESENTATIVE (GOV REP)
- OUTSIDE PROCESSING
- INSPECTION OPERATION

AMSU BLANKETS
FOR A1 ASSEMBLIES

ITEM	METSAT	EOS	METOP
1	1331626-2	1331626-2	TBD
2	1331626-3	1331626-3	TBD
3	1331626-4	1331626-4	TBD
4	1331626-5	1331626-5	TBD
5	1331626-6	1331626-6	TBD
6	1331626-7	1331626-7	TBD
7	1331626-8	1331626-8	TBD
8	1331626-9	1331626-9	TBD

PART DASH NO. | NEXT ASSY | FINAL | NEXT ASSEMBLY | USED ON
APPLICATION
DTE RESP ASSY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
.XX ± .03 ± 2°
.XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING
DRAWING INTERPRETATION PER

CONTR NO	NAS 5-32314	
DRAWN	H. AANDAHL	9-24-96
CHECK	J. GOODROW	3-19-97
DESIGN	R. PLATT	3-3-97
STRESS/ANAL	R. RODRIGUEZ	3-19-97
MATERIALS/PMC	M. BINNEY	3-19-97
PRODUCTION & INSPECTION		3-19-97
DESIGN ACTIVITY	R. HAUERKAMP	3-19-97
Q.A.	R. TAYLOR	3-19-97
C.M.	J. CAVANAUGH	3-19-97

GenCorp Aerojet — Electronic Systems Division
PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION THERMAL EOS/METSAT-A1

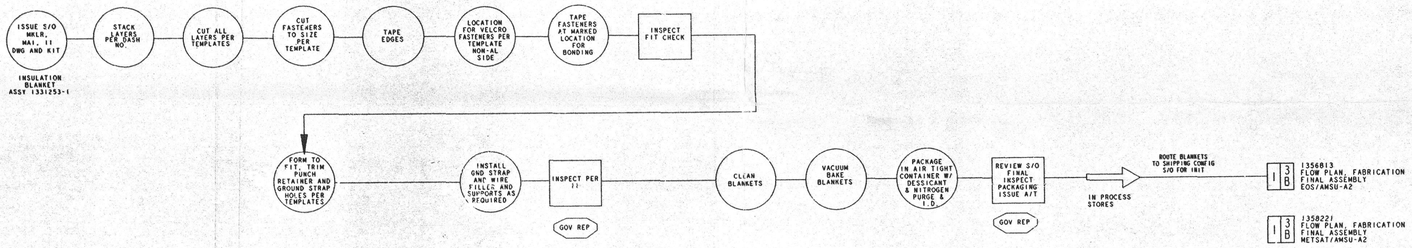
SIZE E | CAGE CODE 70143 | DWG NO. 1358099
SCALE | REL DATE | WT | SHEET 1 OF 1

PROE SOFTMAT

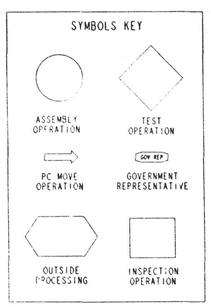
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	97/10/29	

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



SYMBOLS KEY



AMSU BLANKETS
FOR A2 ASSEMBLIES

ITEM	METSAT	EOS	METOP
1	1331253-2	1331253-2	TBD
2	1331253-3	1331253-3	TBD
3	1331253-4	1331253-4	TBD
4	1331253-5	1331253-5	TBD

PART OR DASH NO	NEXT HIGH ASSY	FINAL	NEXT ASSEMBLY	USED ON APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER DOD-D-1000

CONTR NO.	NAS 5-32314	
DRAWN	M. ANWAR	10-7-96
CHECK	J. GOODROW	3-19-97
DESIGN	R. PLATT	3-3-97
STRESS	R. RODRIGUEZ	3-19-97
MATERIALS	J. BINNEY	3-19-97
PRODUCTION	G. KIRKPATRICK	3-19-97
DESIGN ACTIVITY	R. HAUERWAAS	3-19-97
Q.A.	R. TAYLOR	3-19-97
C.M.	J. CAVANAUGH	3-19-97

GENCORP AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION THERMAL EOS/METSAT-A2

SIZE	CAGE CODE	DWG NO.	
E	70143	1358163	
SCALE NONE	REL DATE	WT	SHEET 1 OF 1

PROVE SOFTWARE

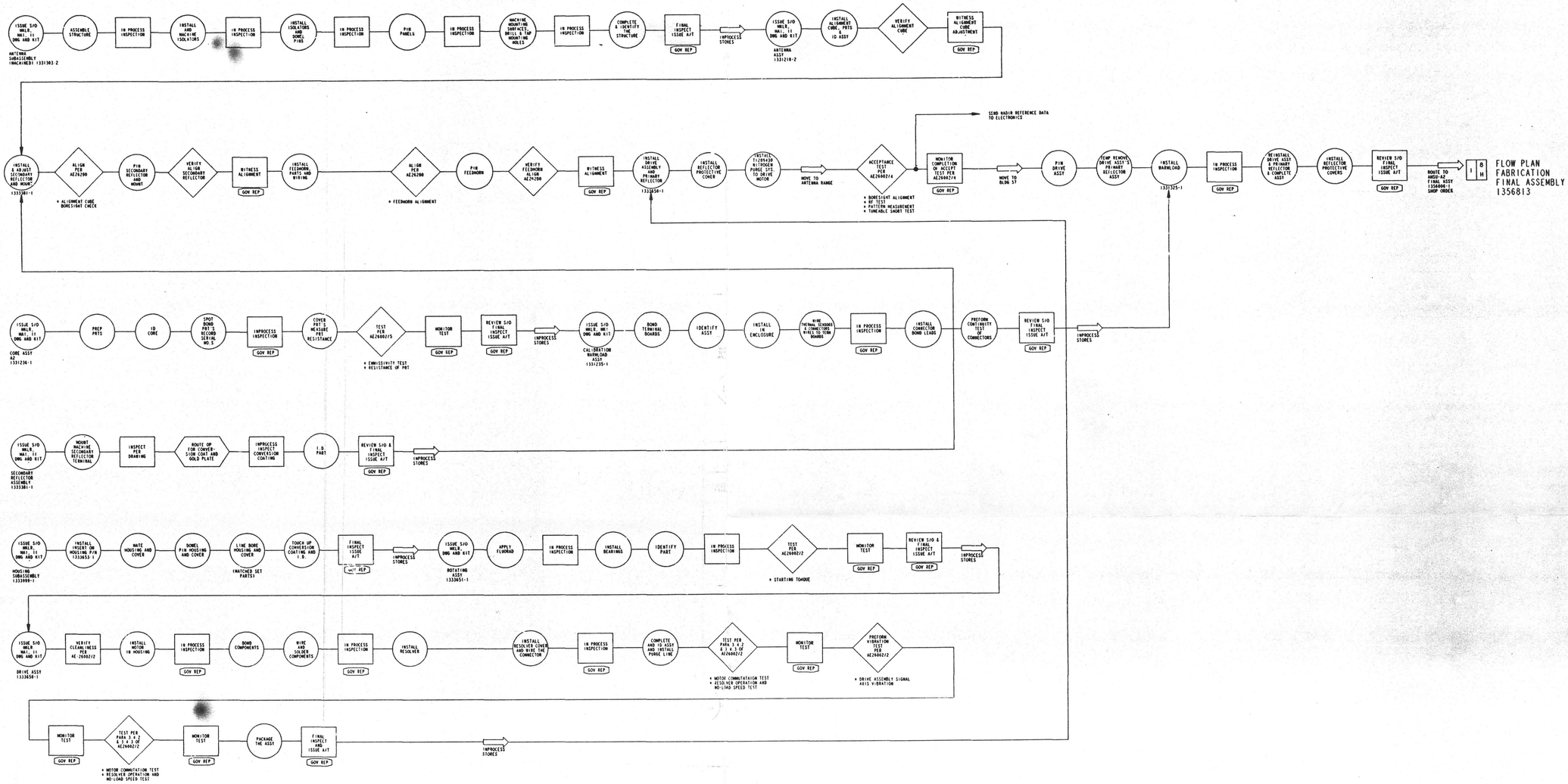
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.

EOS/AMSU-A2

ANTENNA ASSEMBLY 1331210-2



SYMBOLS KEY

- ASSEMBLY OPERATION
- TEST OPERATION
- PREFORMED AT LOWER LEVEL
- PC MOVE OPERATION
- GOVERNMENT REPRESENTATIVE (GOV REP)
- OUTSIDE PROCESSING
- INSPECTION OPERATION

PART OR DASH NO.	NEXT ASSY	FINAL ASSY	NEXT ASSEMBLY	USED ON
	972 REQD PER ASSY		APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
.XX ± .03 ± 2°
.XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER DOD-D-1000

CONTR NO. NAS 5-32314		
DRAWN J.COLEGROVE	96/03/09	
CHECK J.GOODRUM	97/10/28	
DESIGN R.PLATT	97/10/28	
STRESS		
MATERIALS		
PRODUCTION G.KIRKPATRICK	97/10/28	
DESIGN ACTIVITY R.MAHERRAS	97/10/28	
Q.A. S.HERRERA	97/10/28	
C.M. J.CAVARAGGIO	97/10/28	

GenCorp Aerojet — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, ANTENNA ASSEMBLY EOS/AMSU-A2

SIZE	CAGE CODE	DWG NO.
E	70143	1356814

SCALE NONE | REL DATE 97/10/31 | WT | SHEET 1 OF 1

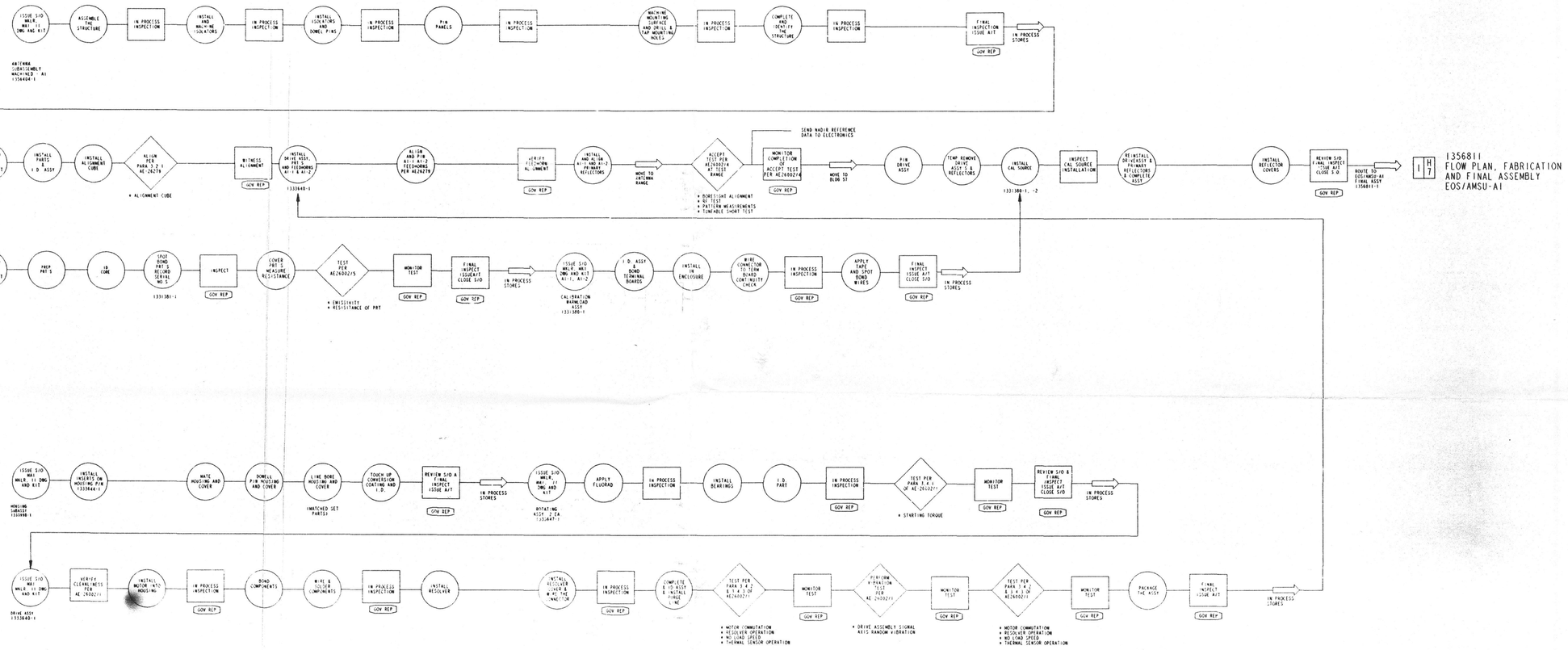
PRO/E SOFTRADE

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL TSETING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.

EOS/AMSU-A1 ANTENNA ASSEMBLY 1356403-1



SYMBOLS KEY

- ASSEMBLY OPERATION
- TEST OPERATION
- PC MOVE OPERATION
- GOV REP — GOVERNMENT REPRESENTATIVE
- OUTSIDE PROCESSING
- INSPECTION OPERATION
- GOVERNMENT INSPECTION
- PERFORMED AT LOWER LEVEL

UNLESS OTHERWISE SPECIFIED	CONTR NO NAS 5-32314	GenCorp Aerojet — Electronic Systems Division, PO Box 296, Azusa, CA 91702
DIMENSIONS ARE IN INCHES TOLERANCE DECIMALS ANGLES XX ± .03 ± 2° XXX ± .010 SURFACE FINISH ✓ DO NOT SCALE DRAWING	DRAWN J COLEGROVE 96-02-22 CHECK J GOODROW 97/10/28 DESIGN R PLATT 97/10/28 STRESS MATERIALS PRODUCTION G KIRKPATRICK 97/10/28 DESIGN ACTIVITY R MAUERMAN 97/10/28 Q A J HERRERA 97/10/28	TITLE: FLOW PLAN, ANTENNA ASSEMBLY EOS/AMSU-A1
DRAWING INTERPRETATION PER DOD-D-1000	C.M. J CAVANAUGH 97/10/28	SIZE E; CAGE CODE 70143; DWG NO 1356812; SCALE NONE; REL DATE 97/10/28; WT; SHEET 1 OF 1
PART NO; NEXT ASSY; USED ON; APPLICATION		

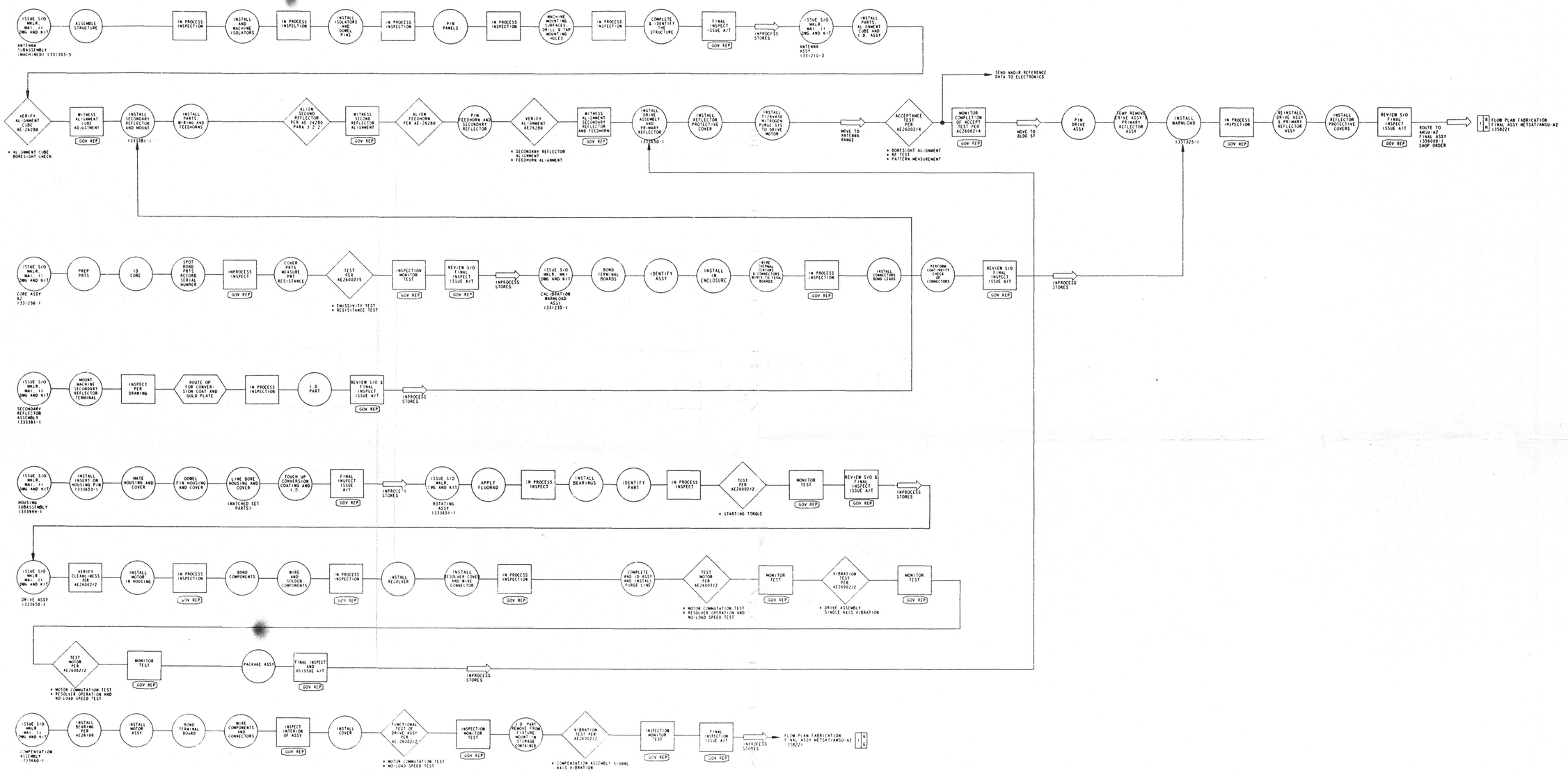
PROJE SOFTWARE

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

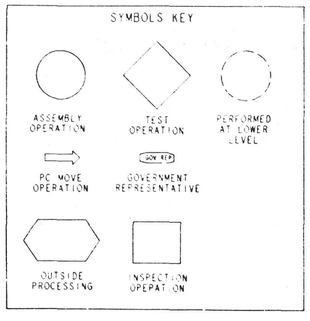
NOTES:

METSAT/AMSU-A2

ANTENNA ASSEMBLY
1331210-3



SYMBOLS KEY



PART NO	NEXT	FINAL	NEXT ASSEMBLY	USED ON	
DASH NO	914 4599 A599		APPLICATION		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING
DRAWING INTERPRETATION PER 000-D-1000

CONTR NO NAS 5-32314

DRAWN	R. A. CORREA	96/11/06
CHECK	J. GOODROW	97/10/28
DESIGN	R. PLATT	97/10/28
STRESS		
MATERIALS		
PRODUCTION	G. KIRKPATRICK	97/10/28
DESIGN ACTIVITY	R. RAMERMAS	97/10/28
Q.A.	S. HERRERA	97/10/28
C.M.	J. CAVANAUGH	97/10/28

GENCORP AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE
FLOW PLAN, ANTENNA ASSEMBLY METSAT/AMSU-A2

SIZE	CAGE CODE	DWG NO.
E	70143	1358225

SCALE NONE | REL DATE 97/10/28 | WT | SHEET 1 OF 1

PROVE SOFTWARE

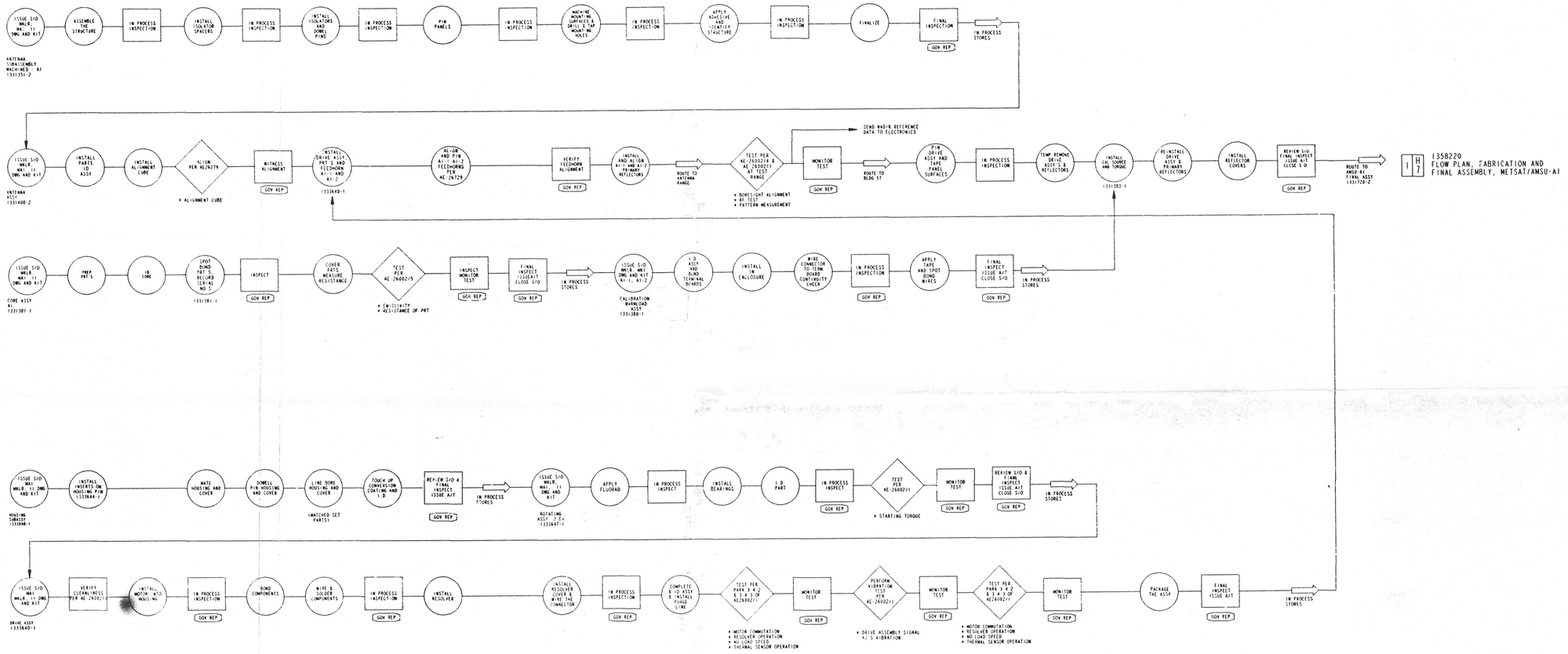
DO NOT SCALE 1358225 SH 1 REV A

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.

METSAT/AMSU-A1 ANTENNA ASSEMBLY 1331400-2



SYMBOLS KEY

- ASSEMBLY OPERATION
- TEST OPERATION
- PC MOVE OPERATION
- GOVERNMENT REPRESENTATIVE
- OUTSIDE PROCESSING
- INSPECTION OPERATION
- GOVERNMENT INSPECTION
- PERFORMED AT LOWER LEVEL

PART CAGE NO	NEXT HIGH ASSY	NEXT ASSEMBLY	USED ON
	STS 2120 F/A 2229	APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER DOD-D-1000

CONTR NO.	NAS 5-32314	
DRAWN	D KRAMER	96-11-06
CHECK	J GODFOM	97/10/28
DESIGN	R PLATT	97/10/28
STRESS		
MATERIALS		
PRODUCTION	G KIRKPATRICK	97/10/28
DESIGN ACTIVITY	R MADERMAS	97/10/28
Q.A.	S HERRERA	97/10/28
C.M.	J.CAVANAUGH	97/10/28

GENCORP AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702

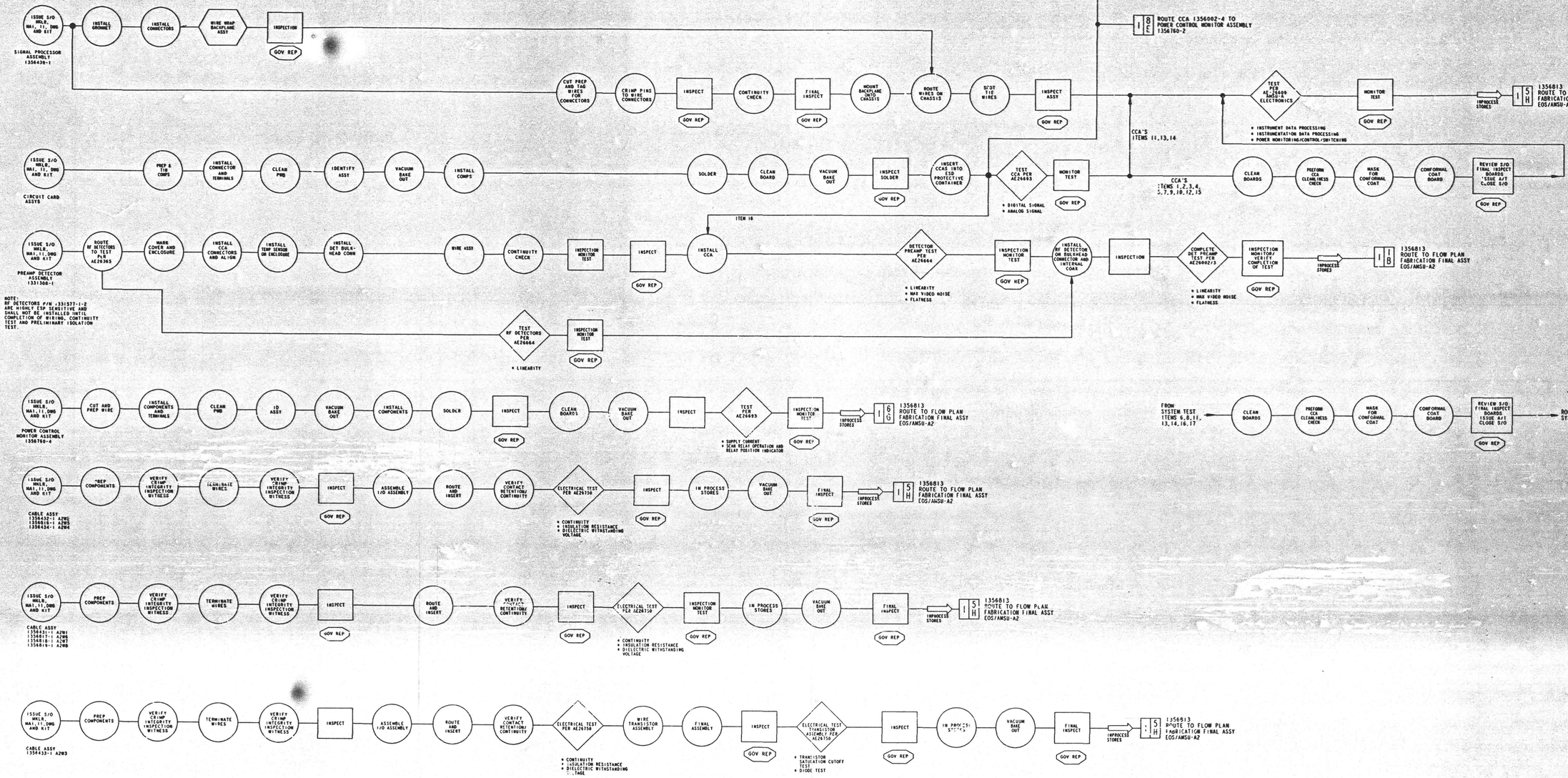
TITLE: FLOW PLAN, ANTENNA ASSEMBLY METSAT/AMSU-A1

SIZE	CAGE CODE	DWG NO.
E	70143	1358224
SCALE NONE	REL DATE	WT
SHEET 1 OF 1		

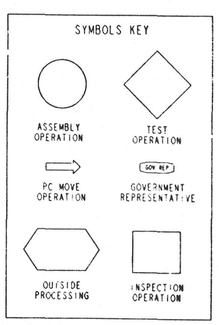
PROVE SOFTWARE

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	10/24/97	

NOTES:
1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



SYMBOLS KEY



CCA'S FOR EOS A2 ASSEMBLE 1356006-1

ITEM	SIGNAL PROCESSOR 1356439-1	PREAMP DETECTOR 1331300-1	POWER CONTROL/MONITOR 1356760-4
1	1331688-1		
2	1331682-1		
3	1338421-1		
4	1356418-1		
5	1338424-1		
6	1355998-1		
7	1331135-2		
8	1331126-18		
9	1331129-1		
10	1356000-2		
11	*1331697-1		
12	1334972-1		
13	*1337739-2		
14	*1331694-4		
15	1336413-1		
16		*1331074-3	
17			*1356002-4

* CCA THAT HAS TBS COMPONENTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER DOD-D-1000

PART DASH NO. | NEXT REL ASSY | FINAL | NEXT ASSEMBLY | USED ON APPLICATION

CONTR NO	NAS 5-32314	
DRAWN	M. AMMAR	10-7-96
CHECK	J. GOODROW	3-19-97
DESIGN	R. PLATT	3-3-97
STRESS NASA	R. RODRIGUEZ	3-19-97
MATER/PARTS QCE	N. BINNEY	3-19-97
PRODUCTION	G. KIRKPATRICK	3-19-97
DESIGN ACTIVITY	R. HAUERWAAS	3-19-97
Q.A.	R. TAYLOR	3-19-97
C.M.	J. CAVANAUGH	3-19-97

GenCorp Aerojet — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION ELECTRONIC EOS/AMSU-A2

SIZE E | CAGE CODE 70143 | DWG NO. 1358162 | REV A

SCALE NONE | REL DATE | WT | SHEET 1 OF 1

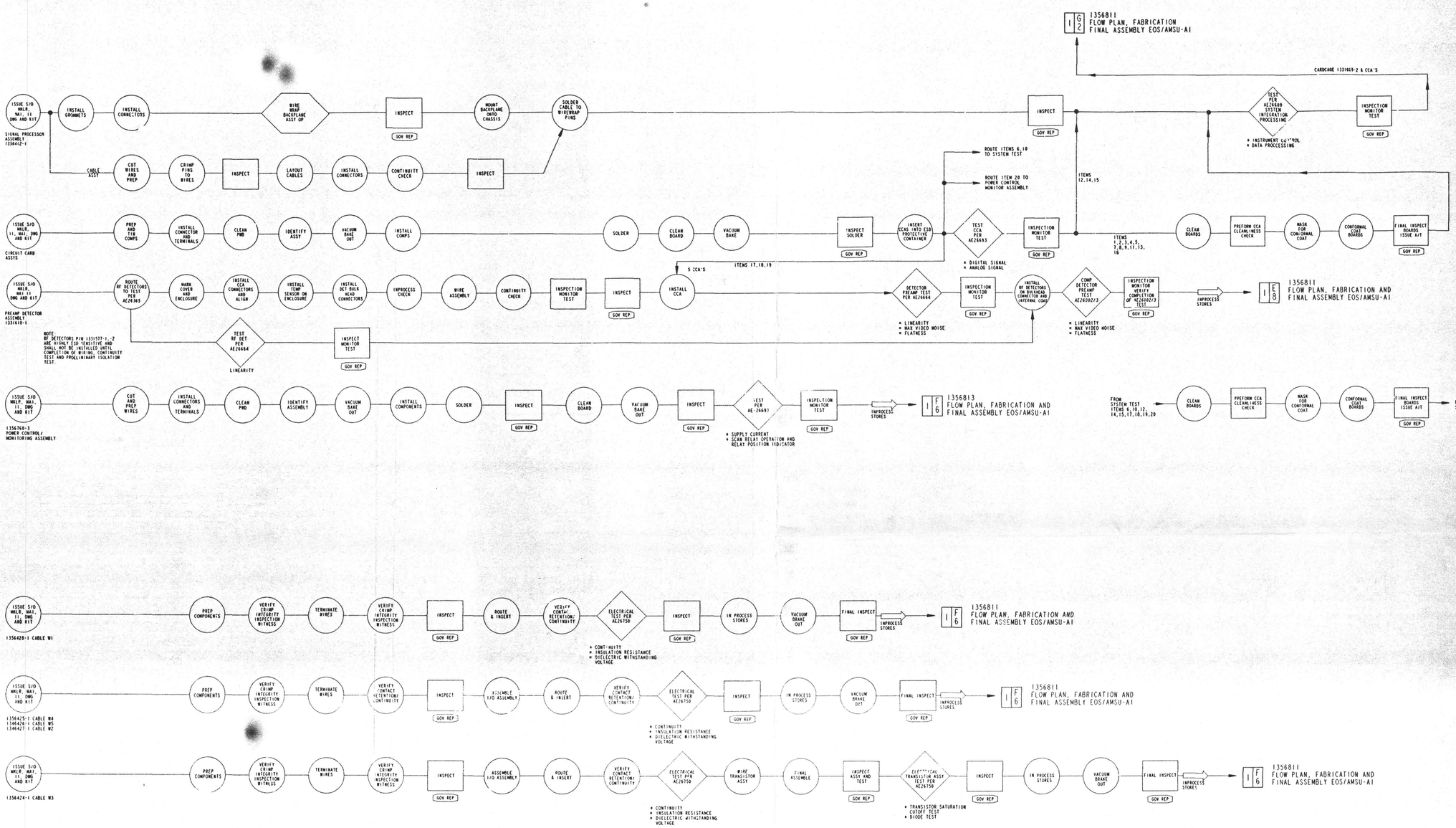
DWG NO. 1358162 REV A

FORM: 30TF0008

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	94/10/29	97/10/24

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE, UNLESS OTHERWISE STATED.



SYMBOLS KEY

DCMC/ NASA
STORES OPERATION
ASSEMBLY OPERATION
TEST OPERATION
GOV REP
PC MOVE OPERATION
GOVERNMENT REPRESENTATIVE
OUTSIDE PROCESSING
INSPECTION OPERATION

CCA'S
FOR EOS A1 ASSEMBLE 1354008-1

ITEM	SIGNAL PROCESSOR 1356412-1	PREAMP DETECTOR 1331610-1	POWER CONTROL/MONITOR 1356760-3
1	1338429-1		
2	1331682-1		
3	1331688-1		
4	1356418-1		
5	1338421-1		
6	1355998-1		
7	1356000-1		
8	1331135-1		
9	1356413-1		
10	1331126-17		
11	1331129-1		
12	* 1331697-1		
13	1334972-1		
14	*1337739-1		
15	*1331694-3		
16	1331682-2		
17		* 1331074-1	
18		* 1331574-2	
19		* 1331157-1	
20			* 1356022-3

* CCA THAT HAS T&S COMPONENTS

PART DASH NO	NEXT ASSY	FINAL ASSY	NEXT ASSEMBLY APPLICATION	USED ON
	PER ASSY	PER ASSY		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
.XX ± .03 ± 2°
.XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING
DRAWING INTERPRETATION PER

CONTR NO.	NAS 5-32314	
DRAWN	W ANNAR	10-24-96
CHECK	J. GOODROW	3-19-97
DESIGN	R PLATT	3-3-97
G/MGR, NASA	R RODRIGUEZ	3-19-97
MATERIALS, SCHC	W BINNEY	3-19-97
PRODUCTION G/A PREPARTICK		3-19-97
DESIGN ACTIVITY	R HAUERWAAS	3-19-97
Q/A	R TAYLOR	3-19-97
C M	J.CAVANAUGH	3-19-97

GENCORP AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION ELECTRONICS EOS/AMSU-A1

SIZE	CAGE CODE	DWG NO.
E	70143	1358098

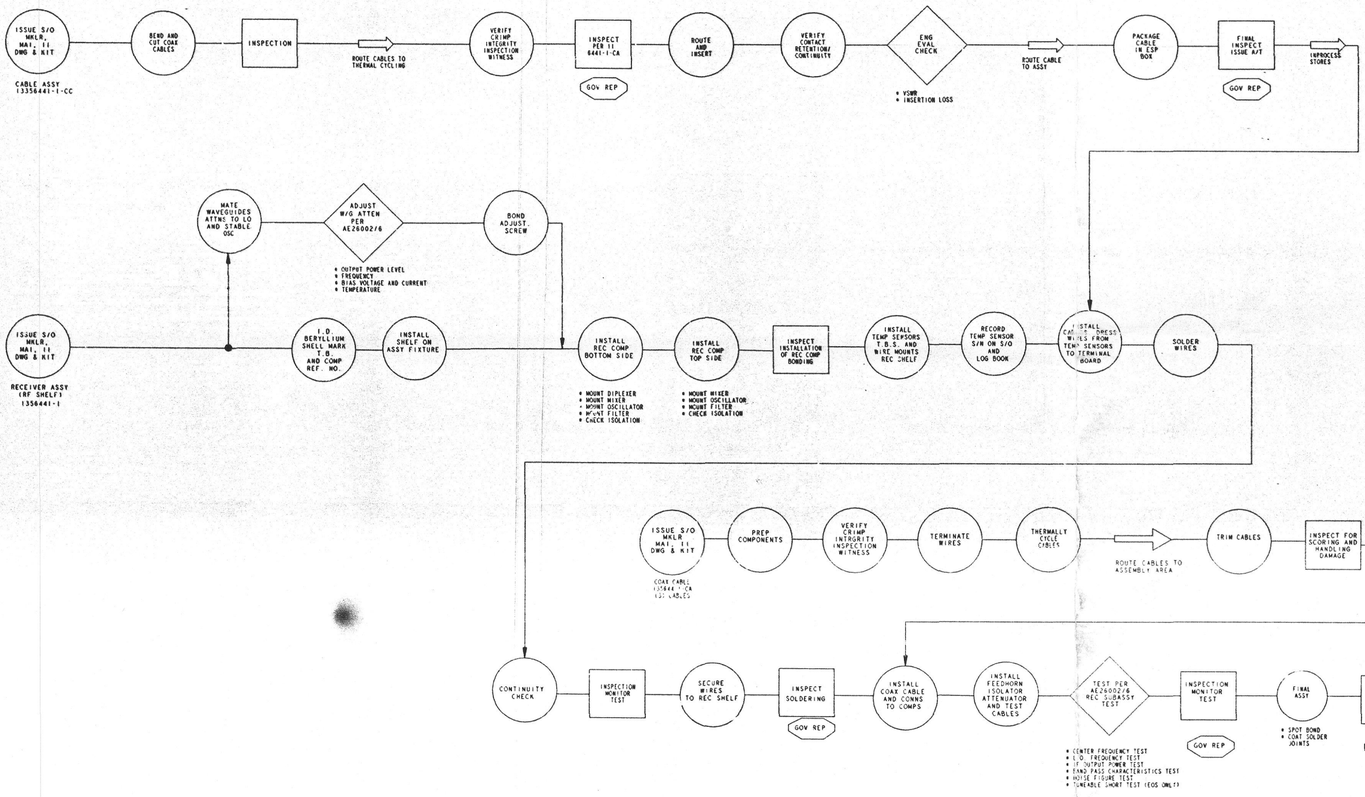
SCALE	REL DATE	WT	SHEET 1 OF 1

PROJE SOFTWARE

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	9-11-01-29	9/20/29

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



SYMBOLS KEY

ASSEMBLY OPERATION

TEST OPERATION

PC MOVE OPERATION

GOVERNMENT REPRESENTATIVE

OUTSIDE PROCESSING

INSPECTION OPERATION

PARENT P/N	NEXT F/AL P/N	NEXT ASSEMBLY	USED ON
CAGE NO	PER MSFC 4508	APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± 03 ± 2°
XXX ± 010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER DOD-D-1000

CONTR NO	NAS 5-32314	
DRAWN	M. AMMAR	10-7-96
CHECK	J. GOODROW	3-19-97
DESIGN	R PLATT	3-3-97
~~STRESS~~ NASA	R. RODRIGUEZ	3-19-97
~~MATERIALS~~ NLMC	M BINNEY	3-19-97
PRODUCTION	G KIRKPATRICK	3-19-97
DESIGN ACTIVITY	R. HAUERWAAS	3-19-97
Q.A.	R TAYLOR	3-19-97
C.M.	J.CAVANAUGH	3-19-97

GenCorp Aerojet — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION RECEIVER EOS/METSAT-A2

SIZE	CAGE CODE	DWG NO.
E	70143	1358164

SCALE NONE | REL DATE | WT | SHEET 1 OF 1

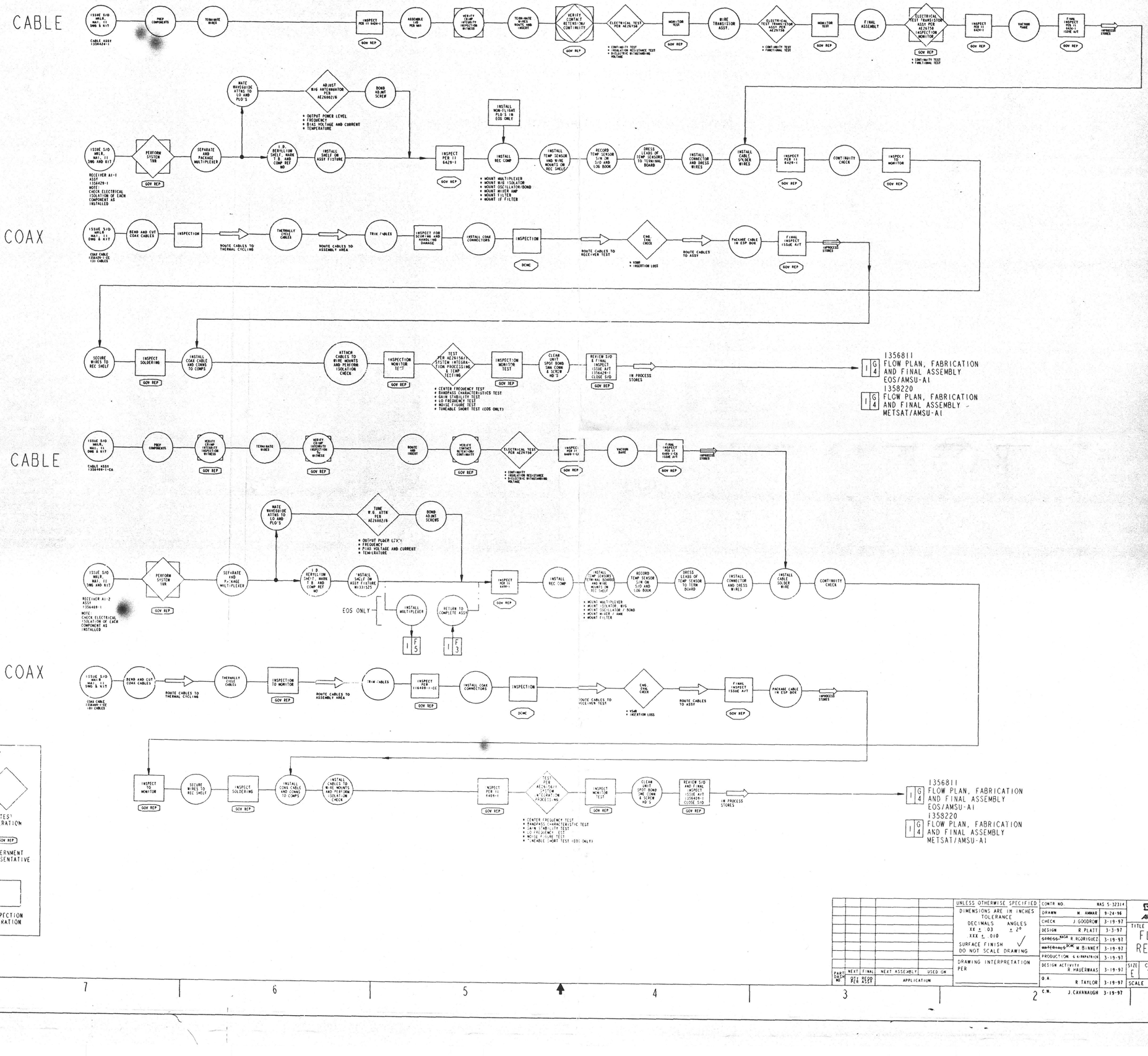
DO NOT SCALE 1358164 REV A

PRO-E SOFTWARE

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	9/16/97	

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMP. UNLESS OTHERWISE SPECIFIED.



PART DASH NO	NEXT FINAL	NEXT ASSEMBLY	USED ON
	974 9599	APPLICATION	
	974 9599		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING
DRAWING INTERPRETATION PER

CONTR NO.	NAS 5-32314	
DRAWN	M. AMMAR	9-24-96
CHECK	J. GOODROW	3-19-97
DESIGN	R PLATT	3-3-97
~~STRESS~~ NASA	R RODRIGUEZ	3-19-97
~~MATERIALS~~ NOR	M BINNEY	3-19-97
PRODUCTION	G KIRKPATRICK	3-19-97
DESIGN ACTIVITY	R HAUERWAAS	3-19-97
Q.A	R TAYLOR	3-19-97
C.M.	J.CAVANAUGH	3-19-97

GENCORP AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION RECEIVERS EOS/METSAT-A1

SIZE	CAGE CODE	DWG NO
E	70143	1358100

SCALE	REL DATE	WT	SHEET 1 OF 1

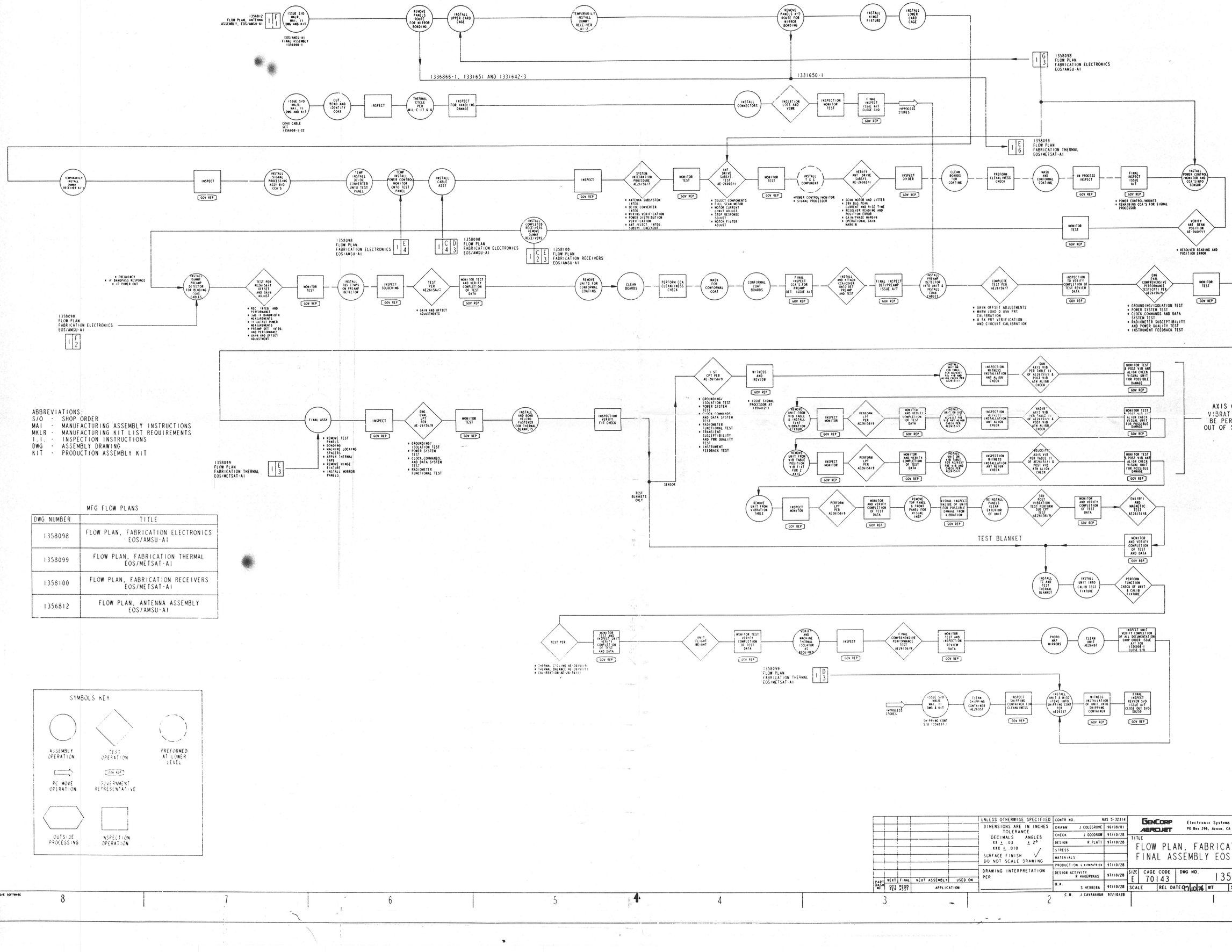
CREATED ON DMS 1358100 REV A

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.

EOS/AMSU-A1 FINAL ASSEMBLY



ABBREVIATIONS:

S/O	SHOP ORDER
MAI	MANUFACTURING ASSEMBLY INSTRUCTIONS
MKLR	MANUFACTURING KIT LIST REQUIREMENTS
I.I.	INSPECTION INSTRUCTIONS
DWG	ASSEMBLY DRAWING
KIT	PRODUCTION ASSEMBLY KIT

MFG FLOW PLANS

DWG NUMBER	TITLE
1358098	FLOW PLAN, FABRICATION ELECTRONICS EOS/AMSU-A1
1358099	FLOW PLAN, FABRICATION THERMAL EOS/METSAT-A1
1358100	FLOW PLAN, FABRICATION RECEIVERS EOS/METSAT-A1
1356812	FLOW PLAN, ANTENNA ASSEMBLY EOS/AMSU-A1

PART DASH NO	NEXT ASSY	FINAL ASSY	WEAT ASSEMBLY	USED ON APPLICATION			

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE
DECIMALS ANGLES
XX ± .03 ± 2°
XXX ± .010
SURFACE FINISH ✓
DO NOT SCALE DRAWING

DRAWING INTERPRETATION PER

CONTR NO.	NAS 5-32314	
DRAWN	J.COLEGROVE	96/08/01
CHECK	J.GOODROW	97/10/28
DESIGN	R.PLATT	97/10/28
STRESS		
MATERIALS		
PRODUCTION	G.KIRKPATRICK	97/10/28
DESIGN ACTIVITY	R.HAUERWAAS	97/10/28
Q.A.	S.HERRERA	97/10/28
C.M.	J.CAVANAUGH	97/10/28

GenCorp Aerojet — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION AND FINAL ASSEMBLY EOS/AMSU-A1

SIZE	CAGE CODE	DWG NO.
E	70143	1356811

SCALE	REL DATE	WT	SHEET
	9/10/26		1 OF 1

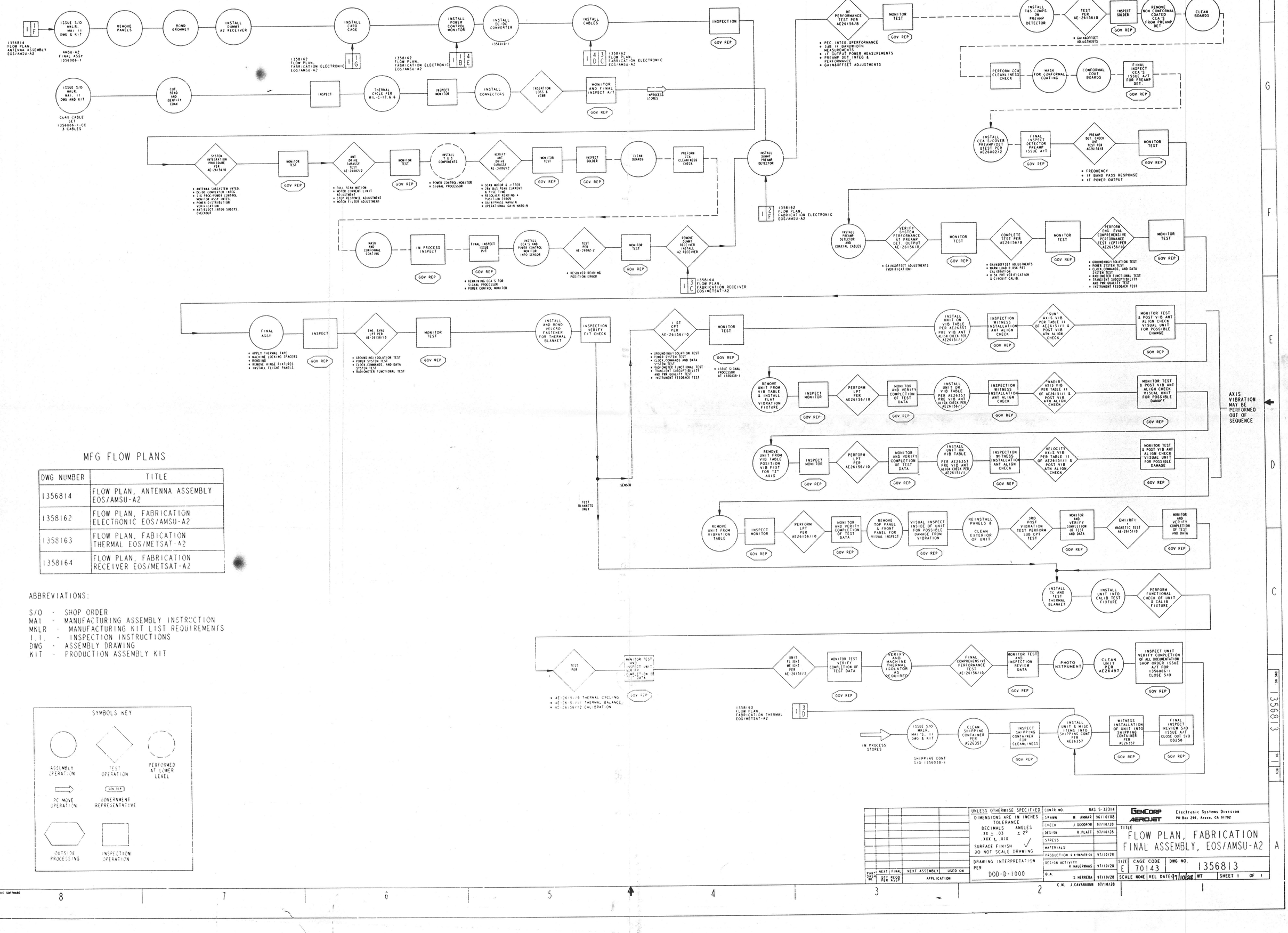
PROJECT SOFTWARE

DWG NO 1356811 SH 1 REV A

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



MFG FLOW PLANS

DWG NUMBER	TITLE
1356814	FLOW PLAN, ANTENNA ASSEMBLY EOS/AMSU-A2
1358162	FLOW PLAN, FABRICATION ELECTRONIC EOS/AMSU-A2
1358163	FLOW PLAN, FABICATION THERMAL EOS/METSAT-A2
1358164	FLOW PLAN, FABRICATION RECEIVER EOS/METSAT-A2

ABBREVIATIONS:

S/O - SHOP ORDER
MAI - MANUFACTURING ASSEMBLY INSTRUCTION
MKLR - MANUFACTURING KIT LIST REQUIREMENTS
I.I. - INSPECTION INSTRUCTIONS
DWG - ASSEMBLY DRAWING
KIT - PRODUCTION ASSEMBLY KIT

UNLESS OTHERWISE SPECIFIED	CONTR NO	NAS 5-32314		
DIMENSIONS ARE IN INCHES TOLERANCE DECIMALS XX ± .03 XXX ± .010 ANGLES ± 2°	DRAWN	M AMMAR	96/10/08	GenCorp AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702
SURFACE FINISH ✓ DO NOT SCALE DRAWING	CHECK	J GOODROW	97/10/28	TITLE: FLOW PLAN, FABRICATION FINAL ASSEMBLY, EOS/AMSU-A2
DRAWING INTERPRETATION PER DOD-D-1000	DESIGN	R PLATT	97/10/28	
	STRESS			
	MATERIALS			
	PRODUCTION	G KIRKPATRICK	97/10/28	
	DESIGN ACTIVITY	R HAUERWAAS	97/10/28	SIZE E; CAGE CODE 70143; DWG NO. 1356813
	Q.A.	S HERRERA	97/10/28	SCALE NONE; REL DATE 97/10/28; WT; SHEET 1 OF 1
	C.M.	J.CAVANAUGH	97/10/28	

PART NO	DASH NO	NEXT ASSY	FINAL PER AS97	NEXT ASSEMBLY	USED ON
				APPLICATION	

1356813

PROJE SOFTRADE

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.

EOS/AMSU-A1 FINAL ASSEMBLY

ABBREVIATIONS:
- S/O - SHOP ORDER
- MAI - MANUFACTURING ASSEMBLY INSTRUCTIONS
- MKLR - MANUFACTURING KIT LIST REQUIREMENTS
- I.I. - INSPECTION INSTRUCTIONS
- KIT - PRODUCTION ASSEMBLY KIT
- DWG - ASSEMBLY DRAWING

MFG FLOW PLANS

DWG NUMBER	TITLE
1358222	FLOW PLAN, FABRICATION ELECTRONICS METSAT/AMSU-A1
1358099	FLOW PLAN, FABRICATION THERMAL EOS/METSAT-A1
1358100	FLOW PLAN, FABRICATION RECEIVERS EOS/METSAT-A1
1358224	FLOW PLAN, ANTENNA ASSEMBLY METSAT/AMSU-A1

SYMBOLS KEY

ASSEMBLY OPERATION · TEST OPERATION · PREFORMED AT LOWER LEVEL · PC MOVE OPERATION · GOVERNMENT REPRESENTATIVE · OUTSIDE PROCESSING · INSPECTION OPERATION

X,Y&Z -AXIS VIBRATION MAY BE PERFORMED OUT OF SEQUENCE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE DECIMALS XX ± .03 XXX ± .010 ANGLES ± 2° SURFACE FINISH ✓ DO NOT SCALE DRAWING	CONTR NO	NAS 5-32314	GENCORP AEROJET	Electronic Systems Division PO Box 296, Azusa, CA 91702			
	DRAWN	D KRAMER 96/11/06					
	CHECK	J. GOODROW 97/10/28					
	DESIGN	R. PLATT 97/10/28	TITLE	FLOW PLAN, FABRICATION AND FINAL ASSEMBLY METSAT/AMSU-A1			
	STRESS						
	MATERIALS						
	PRODUCTION	G KIRKPATRICK 97/10/28					
DRAWING INTERPRETATION PER	DESIGN ACTIVITY	R HAUERWAAS 97/10/28	SIZE	CAGE CODE	DWG NO.		
	Q.A.	S HERRERA 97/10/28	E	70143	1358220		
	C.M.	J CAVANAUGH 97/10/28	SCALE	REL DATE	WT	SHEET 1 OF 1	

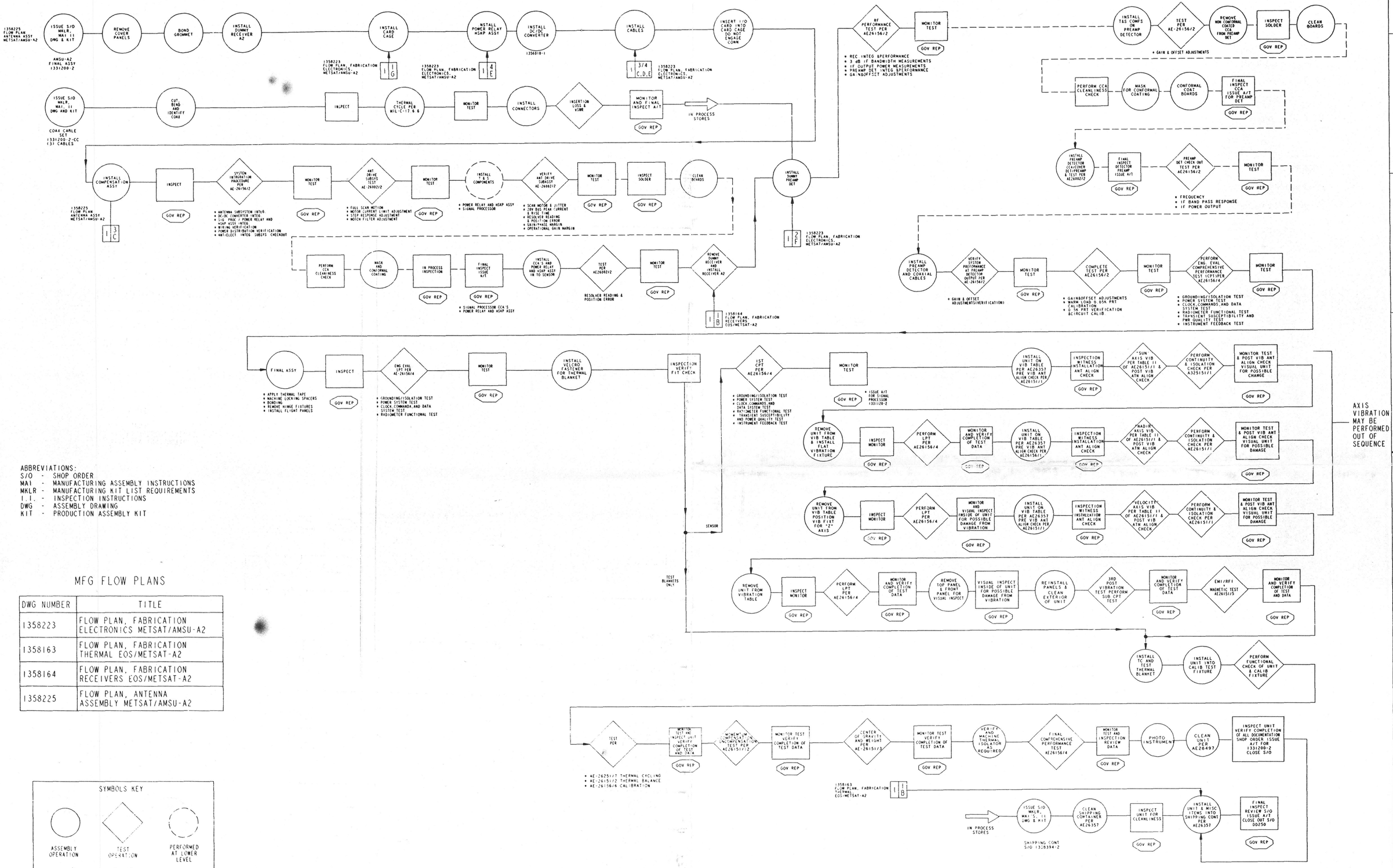
PART DASH NO	NEXT ASSY	FINAL ASSY	NEXT ASSEMBLY APPLICATION	USED ON
	P/O	ASSY		

PRO/E SOFTWARE

1358220 SH 1 REV

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

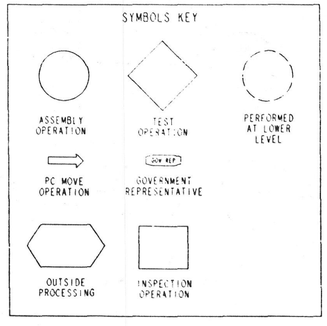
NOTES:
1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.



ABBREVIATIONS:
S/O - SHOP ORDER
MAI - MANUFACTURING ASSEMBLY INSTRUCTIONS
MKLR - MANUFACTURING KIT LIST REQUIREMENTS
I.I. - INSPECTION INSTRUCTIONS
DWG - ASSEMBLY DRAWING
KIT - PRODUCTION ASSEMBLY KIT

MFG FLOW PLANS

DWG NUMBER	TITLE
1358223	FLOW PLAN, FABRICATION ELECTRONICS METSAT/AMSU-A2
1358163	FLOW PLAN, FABRICATION THERMAL EOS/METSAT-A2
1358164	FLOW PLAN, FABRICATION RECEIVERS EOS/METSAT-A2
1358225	FLOW PLAN, ANTENNA ASSEMBLY METSAT/AMSU-A2



UNLESS OTHERWISE SPECIFIED	CONTR NO.	NAS 5-32314	GENCORP AEROJET Electronic Systems Division PO Box 296, Azusa, CA 91702	
DIMENSIONS ARE IN INCHES TOLERANCE DECIMALS ANGLES XX ± .03 ± 2° XXX ± .015	DRAWN	R.A. CORREA 96/11/06	TITLE	FLOW PLAN, FABRICATION FINAL ASSEMBLY, METSAT/AMSU-A2
SURFACE FINISH ✓ DO NOT SCALE DRAWING	CHECK	J. GOODROW 97/10/28		
DRAWING INTERPRETATION PER DOD-D-1000	DESIGN	R. PLATT 97/10/28		
	STRESS			
	MATERIALS			
	PRODUCTION & R/REPATRICK	97/10/28		
	DESIGN ACTIVITY R. MAUERMAAS	97/10/28	SIZE E	CAGE CODE 70143 DWG NO. 1358221
	Q.A. S. HERRERA	97/10/28	SCALE NONE	REL DATE 97/10/28 WT SHEET 1 OF 1
	C.M. J. CAVANAUGH	97/10/28		

PART DASH NO.	NEXT ASSY	FINAL ASSY	NEXT ASSEMBLY	USED ON APPLICATION

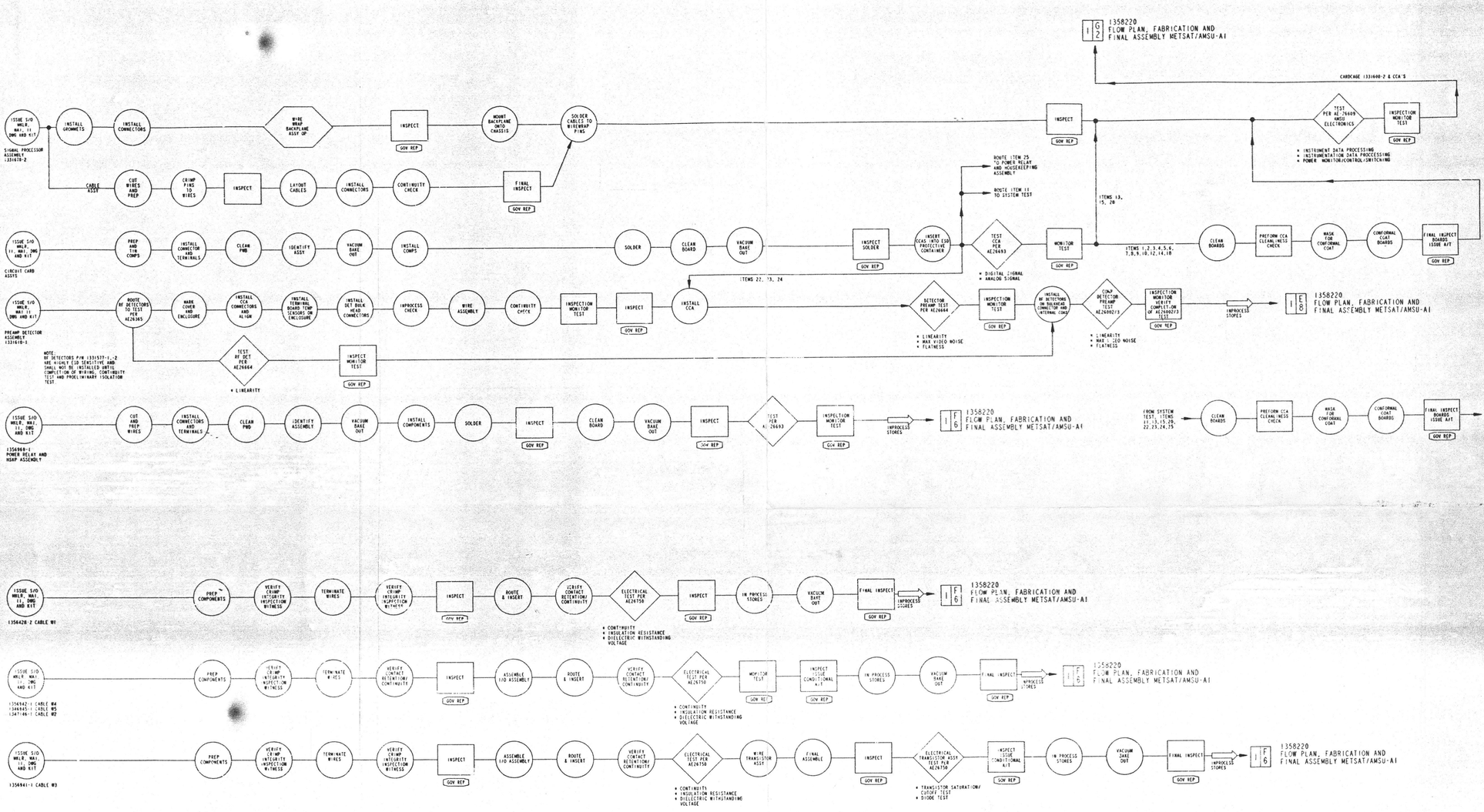
PROVE SOFTWARE

1358221 DO NOT SCALE SH 1 REV

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE INC A DECN	10/29/97	11/7/97

NOTES:

1. ALL TESTING WILL BE DONE AT AMBIENT TEMPERATURE, UNLESS OTHERWISE STATED.



CCA'S FOR METSAT A1 ASSEMBLE 1331720-2			
ITEM	SIGNAL PROCESSOR @ 1356412-1	PREAMP DETECTOR 1331610-1	POWER RELAY HXP 1356969-1
1	1338421-1		
2	1331682-1		
3	1331688-1		
4	1356418-1		
5	1356424-1		
6	1331147-1		
7	1331144-1		
8	1331150-1		
9	1331135-1		
10	1336413-2		
11	1331126-9		
12	1331129-1		
13	* 1335697-1		
14	1349472-1		
15	* 1337739-1		
16			
17			
18	1356934-1		
19			
20	* 1331634-3		
21			
22		* 1331074-1	
23		* 1331074-2	
24		* 1331157-1	
25			* 1356908-1

* CCA THAT HAS T&S COMPONENTS

SYMBOLS KEY

- DEMO / NASA
- STORES OPERATION
- ASSEMBLY OPERATION
- TEST OPERATION
- GOV REP — GOVERNMENT REPRESENTATIVE
- NO MOVE OPERATION
- OUTSIDE PROCESSING
- INSPECTION OPERATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE
DEC MALS ± .XX ANGLES ± .5°
FRC ± .010
SURFACE FINISH
DO NOT SCALE DRAWING
DRAWING INTERPRETATION PER

PART OR CAGE NO	NEXT ASSY USED ON	NEXT ASSEMBLY APPLICATION
	MFG RELEASE PER ASSY	

CONTR NO NAS 5-32314

DRAWN	D. KRAMER	96-11-26
CHECK	J. GOLDROW	3-19-97
DESIGN	R. PLATT	3-3-97
MFG ENGR	R. RODRIGUEZ	3-19-97
MFG REL	M. BENNET	3-19-97
PRODUCTION	G. KIRKPATRICK	3-19-97
DES SUPT ACT'S/E	K. HAUERBAAS	3-19-97
Q.A.	R. TAYLOR	3-19-97
C.M.	J. CAVANAUGH	3-19-97

GENCORP AEROJET — Electronic Systems Division, PO Box 296, Azusa, CA 91702

TITLE: FLOW PLAN, FABRICATION ELECTRONICS METSAT/AMSU-A1

SIZE	CAGE CODE	DWG NO.
E	70143	1358222

SCALE	REL DATE	WT	SHEET 1 OF 1

PROVE SOFTWARE

A 1358222 SH 1 REV A

SECTION 7

ABBREVIATIONS AND ACRONYMS

&	And
AMSU	Advanced Microwave Sounding Unit
Ant.	Antenna
BLDG	Building
BOM	Bill of Material
CCA	Circuit Card Assembly
CDRL	Contract Documentation Requirements List
cg	Center of Gravity
DC/DC	Direct Current-to-Direct Current
DR	Drive
EOS	Earth Observing System
ESD	Electro-Static Discharge
IMITP	Integrated Manufacturing, Inspection, and Test Plan
IPT	Integrated Product Team
MAI	Manufacturing Assembly Instructions
MFG	Manufacturing
MIAB	Manufacturing Indentured Assembly Breakdown
MIL	Military
MITP	Manufacturing, Inspection, and Test Process
MKLR	Manufacturing Kit List Requisition
MPI	Manufacturing Process Instructions
MRP	Manufacturing Resource Planning
NOAA	National Oceanographic and Atmospheric Administration
PLO	Phase-Locked Oscillator
Preamp	Preamplifier
PT	Product Team
RF	Radio Frequency
RTP	Requisitions to Procure
ST	Street
STD	Standard
WIP	Work-in-Process
WT	Weight

Appendix A

Table A-I Production Tooling List

Ref	P/N	Nomenclature
1	1331177	Base Assembly, AMSU-A1 Calibration Fixture
2	1331333	Cover Bracket
3	1331385	Reflector Protection Hood
4	1331656	Reflector Protective Hood
5	1333060	Handling Plate, A1 and A2
6	1333124	Handling Sling Assembly and Installation, A2
7	1333190	Installation Dolly
8	1333191	Rail Assembly, Installation Dolly
9	1333200	AMSU-A2 Calibration Fixture Assembly and Installation
10	1337427	ESD Cover (Instrument)
11	1337745	Lifting Fixture, A1 Z-Axis
12	1337749	Lifting Fixture, Vibration, AMSU-A1
13	1337751	Vertical Lifting Fixture, Vibration, AMSU-A1
14	1337767	A1 Boresight Fixture
15	1337768	A1 Beam Position 1 Fixture
16	1337769	A1 Beam Position 15 Fixture
17	1337770	A1 Beam Position 30 Fixture
18	1337771	A1 Cold Calibrate Fixture
19	1337772	A2 Boresight Fixture
20	1337773	A2 Beam Position 1/30
21	1337774	A2 Beam Postition 15
22	1337775	A2 Cold Calibrate
23	1337806	Lift Fixture - Calibrate AMSU-A1
24	1337807	AMSU - A1 Rotation Fixture
25	1338155	Handling Plate, AMSU-A2
26	1338156	Handling Fixture
28	1338163	Hinged Support Fixture, AMSU A1
29	1338216	Cover Support
30	1338217	Vertical Lift Fixture, A2
31	1338218	Reflector Cover
32	1338225	Handling Sidemount Plate, AMSU-A!
33	1338267	Platform Truck, AMSU A1 and A2
34	1338427	Protection Cover
35	1356614	Handling Plate, EOS/AMSU-A
36	1356615	Drill Jig Fixture, EOS/AMSU-A1
37	1356616	Drill Jig Fixture, EOS/AMSU-A2
38	1356617	Plate, EOS/AMSU-!
39	1356618	Plate
40	1356619	Protective Aligh Cube Housing
41	1356980	Plate, Strain Relief
42	2779T44	Dyna Lift Hydraulic Table
43	T 1289645	A2 Cold Fixture
44	T 1289646	A2 Positioner Beam Fixture
45	T 1289647	A2 Cold Calibration Fixture
46	T1289649	A2 Beam Positioner
47	T1289702-1	A2 Handling Plate
48	T1289702-2	A1 Handling Plate

(Continued)

Table A-I Production Tooling List (Cont'd)

Ref	P/N	Nomenclature
49	T1289711	Rotation Fixture
50	T1289744	Top, Wt & CG Plate
51	T1289764	Calibration Fixture
52	T1289765	Calibration Fixture
53	T1289766	Installation Dolly
54	T1289786	Card Cage Assembly
55	T1289348	Pressure Gauge
56	T1289391	Pressure Gauge
57	T1289430	Nitrogen Purge System
58	T1289432	A2 CTE Spacer/Vertical Lift Fixture
59	T1289452	AMSU Re Fixture
60	T1289518	Blanket Template
61	T1289526-001	A2 In-House Rotating Fixture
62	T1289527-001	A2 In-House Ant. Cover Access Lid
63	T1289535	Safety Shields
64	T1289616	Handle
65	T1289642	A1 Beam Position
66	T1289643	A1 Beam Fixture
67	T1289644	A1 Beam Position Fixture
68	T1289680	AMSU A1 & A2 Instrument Transport Dolly Protective Cover

Appendix B

INTEGRATED MANUFACTURING, INSPECTION, AND TEST PLAN (IMITP)

NASA
National Aeronautics and Space Administration

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
---	---	---

4. Title and Subtitle	5. Report Date
Integrated Advanced Microwave Sounding Unit-A (AMSU-A), Fabrication and Assembly Flow Plan	30 October 1997
	6. Performing Organization Code: ---

7. Author(s)	8. Performing Organization Report No.
G. Kirkpatrick	10361C
	10. Work Unit No.: ---

9. Performing Organization Name and Address	11. Contract or Grant No.
Aerojet 1100 W. Hollyvale Azusa, CA 91702	NAS 5-32314

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
NASA Goddard Space Flight Center Greenbelt, Maryland 20771	Final
	14. Sponsoring Agency Code: ---

15. Supplementary Notes

---

16. ABSTRACT (*Maximum 200 words*)

This is the Fabrication and Assembly Flow Plan for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).

17. Key Words (Suggested by Author(s))	18. Distribution Statement
EOS Microwave System	Unclassified --- Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price
Unclassified	Unclassified		---

NASA FORM 1626 OCT 86

PREPARATION OF THE REPORT DOCUMENTATION PAGE

The last page of a report facing the third cover is the Report Documentation Page, RDP. Information presented on this page is used in announcing and cataloging reports as well as preparing the cover and title page. Thus, it is important that the information be correct. Instructions for filing in each block of the form are as follows:

Block 1. Report No. NASA report series number, if preassigned.

Block 2. Government Accession No. Leave blank.

Block 3. Recipient's Catalog No.. Reserved for use by each report recipient.

Block 4. Title and Subtitle. Typed in caps and lower case with dash or period separating subtitle from title.

Block 5. Report Date. Approximate month and year the report will be published.

Block 6. Performing Organization Code . Leave blank.

Block 7. Authors. Provide full names exactly as they are to appear on the title page. If applicable, the word editor should follow a name.

Block 8. Performing Organization Report No. NASA installation report control number and, if desired, the non-NASA performing organization report control number.

Block 9. Performing Organization Name and Address. Provide affiliation (NASA program office, NASA installation, or contractor name) of authors.

Block 10. Work Unit No. Provide Research and Technology Objectives and Plants (RTOP) number.

Block 11. Contract or Grant No. Provide when applicable.

Block 12. Sponsoring Agency Name and Address. National Aeronautics and Space Administration, Washington, D.C. 20546-0001. If contractor report, add NASA installation or HQ program office.

Block 13. Type of Report and Period Covered. NASA formal report series; for Contractor Report also list type (interim, final) and period covered when applicable.

Block 14. Sponsoring Agency Code. Leave blank.

Block 15. Supplementary Notes. Information not included elsewhere: affiliation of authors if additional space is required for Block 9, notice of work sponsored by another agency, monitor of contract, information about supplements (file, data tapes, etc.) meeting site and date for presented papers, journal to which an article has been submitted, note of a report made from a thesis, appendix by author other than shown in Block 7.

Block 16. Abstract. The abstract should be informative rather than descriptive and should state the objectives of the investigation, the methods employed (e.g., simulation, experiment, or remote sensing), the results obtained, and the conclusions reached.

Block 17. Key Words. Identifying words or phrases to be used in cataloging the report.

Block 18. Distribution Statement. Indicate whether report is available to public or not. If not to be controlled, use "Unclassified-Unlimited." If controlled availability is required, list the category approved on the Document Availability Authorization Form (see NHB 2200.2, Form FF427). Also specify subject category (see "Table of Contents" in a current issue of STAR) in which report is to be distributed.

Block 19. Security Classification (of the report). Self-explanatory.

Block 20. Security Classification (of this page). Self-explanatory.

Block 21. No. of Pages. Count front matter pages beginning with iii, text pages including internal blank pages, and the RDP, but not the title page or the back of the title page.

Block 22. Price Code. If Block 18 shows "Unclassified-Unlimited," provide the NTIS price code (see "NTIS Price Schedules" in a current issue of STAR) and at the bottom of the form add either "For sale by the National Technical Information Service, Springfield, VA 22161-2171" or "For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-0001," whichever is appropriate.

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188). Washington, DC 20503.

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED

4. TITLE AND SUBTITLE
Integrated Advanced Microwave Sounding Unit-A (AMSU-A), Fabrication and Assembly Flow Plan

5. FUNDING NUMBERS
NAS 5-32314

6. AUTHOR(S)
G. Kirkpatrick

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Aerojet
1100 W. Hollyvale
Azusa, CA 91702

8. PERFORMING ORGANIZATION REPORT NUMBER
10361C
30 October 1997

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
NASA
Goddard Space Flight Center
Greenbelt, Maryland 20771

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
---

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

12b. DISTRIBUTION CODE
---

13. ABSTRACT (*Maximum 200 words*)

This is the Fabrication and Assembly Flow Plan for the Integrated Advanced Microwave Sounding Unit-A
(AMSU-A).

14. SUBJECT TERMS
EOS
Microwave System

15. NUMBER OF PAGES

16. PRICE CODE
---

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std 239-18
298-102

GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filing in each block of the form follow. It is important to stay within the lines to meet optical scanning requirements.

Block 1. Agency Use Only *(Leave blank)*

Block 2. Report Date. Full publication date including day, month, and year, if available (e.g., 1 Jan 88). Must cite at least the year.

Block 3. Type of Report and Dates Covered. State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g., 10 Jun 87 - 30 Jun 88).

Block 4. Title and Subtitle. A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

Block 5. Funding Numbers. To include contract and grant numbers; may include program element number(s), project number(s), tasks, number(s), and work unit number(s). Use the following labels:

C	-	Contract	PR	-	Project
G	-	Grant	TA	-	Task
PE	-	Program Element	WU	-	Work Unit Accession No.

Block 6. Author(s). Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

Block 7. Performing Organization Name(s) and Address(es). Self-explanatory.

Block 8. Performing Organization Report Number. Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es). Self-explanatory.

Block 10. Sponsoring/Monitoring Agency Reports Number. *(if known)*.

Block 11. Supplementary Notes. Enter information not included elsewhere such as: Prepared in cooperation with ...; Trans. of ...; To be published in ... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

Block 12.a Distribution/Availability Statement. Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g., NOFORN, REL, ITAR).

DOD - See DoDD 5230.24 *Distribution Statement on Technical Documents*
DOE - See authorities.
NASA - See Handbook NHB 2200.2.
NTIS - Leave blank.

Block 12.b Distribution Code.

DOD - Leave blank.
DOE - Enter DOE distribution categories from the standard Distribution for Unclassified Scientific and Technical Reports.
NASA - Leave blank.
NTIS - Leave blank.

Block 13. Abstract. Include a brief *(Maximum 200 words)* factual summary of the most significant information contained in the report.

Block 14. Subject Terms. Keywords or phases identifying major subjects in the report.

Block 15. Number of Pages. Enter the total number of pages.

Block 16. Price Code. Enter appropriate price code *(NTIS only)*.

Block 17 - 19. Security Classifications. Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

Standard Form 298 Back (Rev. 2-89)